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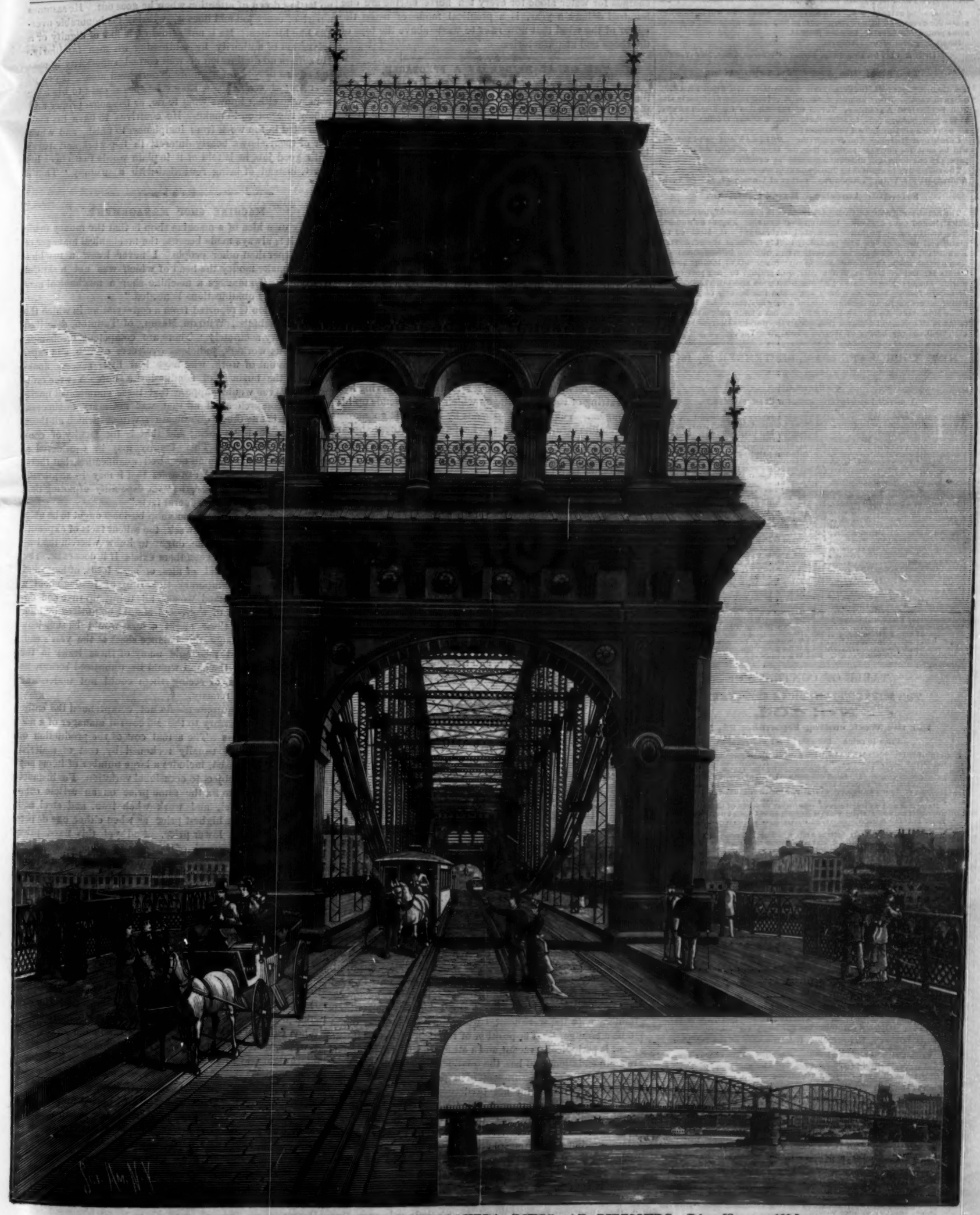

THE NEW BRIDGE OVER THE MONONGAHELA RIVER AT PITTSBURG PA. [See page 180.]

Scientific American.

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NEW YORK, SATURDAY, SEPTEMBER 22, 1883.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 408,

For the Week ending September 22, 1883.

Price 10 cents. For sale by all newsdealers.

THE STORAGE OF WIND POWER.

This interesting subject continues to be discussed by several of our valued correspondents. We give some of their contributions in another column. We notice they omit to give estimates of the works they propose. It would add to the value of such papers if approximate bills of the probable expenses for apparatus, machinery, care, interest, etc., were given. Some of the writers appear to think there is no other way of storing wind power than to pump water to an elevated pond in the country, and use the force of the descending column to drive mechanism. When that is said, they consider the subject exhausted. But what is greatly needed, especially in such a city as New York, the largest manufacturing place in the country, where the local charges for water alone for every ten horse engine are one hundred dollars a year, is a practical mode of using the power of the wind that now runs to waste above the tops of the shops and manufactories.

THE GREAT BRIDGE AS A SPECTACLE.

During all the years of its building, from the sinking of the first caisson to the establishment of the line of electric lights, the construction of the bridge has attracted the interest of engineers and mechanics. But it is doubtful if it has been accorded its value as a work of art and "thing of beauty," except by casual visitors to New York, who have not watched its gradual progress for a dozen years. And yet the bridge is beautiful in itself. Between the two majestic towers, more than one-quarter of a mile apart, the flooring of the bridge makes a very gradual sweep that by its slender curve presents a fine contrast against the level horizon.

From the river, either by the Roosevelt Ferry boats, or those of the Fulton Ferry, the best perspective view of the bridge can be had. From the deck of the ferry boat the wonderful structure looks like a daring gigantic spider's web against the sky. The eye sees all the understructure of the bridge, and unless one is a calculating, almost agnostic mechanic, it is hard to believe that the suspended structure represents solidity and permanency. The four great white lines that connect the two gray towers and extend their inland sweep for a quarter of a mile each way, appear by their curves to be doing no more mechanical service than the curving line of the string of the paper kite on which the boy sends up his messengers. Vehicles and persons by thousands go across this web-like structure in perfect safety. But these appear only as flies, and it is a wonder to the safe passenger on a ferry boat or on a Sound steamer that people will risk themselves on so frail a structure.

But the bridge is a marvel of beauty viewed from the level of the river. In looking at its vast stretch, not only over the river between the towers, but over the inhabited, busy city on either shore, it appears to have a character of its own far above the drudgeries and exactions of the lower business levels.

Of its actual strength nobody can understand by figures and other statistics. Only by going on the bridge can a passenger over it, or a questioner of it, be convinced that it is a permanent structure.

After nightfall, when nothing but the bridge itself interposes between it and the dark sky, with its gracefully curved lines revealed by electric lights and defined by the darkness of the water below, and the other darkness of the sky above, the bridge appears like a gossamer structure, and has a fairy like appearance.

THE FOREMAN.

The position of foreman of a shop or boss of a gang of workmen demands as its object the turning out of a fair amount of good work. Some fill one portion of this demand and others the other portion, but it is only the manager of men who fills both.

Employers are sometimes at fault in demanding from foremen the largest possible amount of work in a given time, always prodding and pushing, grumbling because a job occupied more time than they expected, and picking up every trifling interruption as a deliberate attempt at imposition. If a foreman is honorable and sensitive he will not bear this nagging, and so in shops ruled by such a proprietor changes of foremen are frequent. One such instance occurs to mind, just now, of a proprietor of a very thriving business, requiring the services of nearly a hundred good workmen besides apprentices, who had lost three foremen within two years either by resignation or dismissal. "Can you recommend a good foreman?" he inquired. "You have an excellent man for the place now in your shop," was answered, naming him. "Oh, he'll never do, he's one of the men himself. I don't want a man who is familiar with the workmen; I want a driver, and he ought to be a stranger." The position of foreman in that establishment is periodically vacant, and a stranger who can bring fair recommendations and has the qualifications of a "driver" can generally have assurances of a position, even if he has to wait a short time for his predecessor's shoes. And yet, this proprietor is in no usual sense "a hard man;" he simply has a wrong idea of the duty of a foreman. His ideal foreman is a mechanical blusterer who stirs up cyclones in the shop, produces an atmosphere of general uneasiness, and "makes the men hop round lively," as he once remarked. The workmen make trouble for every new foreman, and his "life is not a happy one."

There are, however, some foremen who are instructors rather than managers of men. Under their rule more time is spent in the details of work, in correcting errors, in "doing over," than should be required to complete the job. The scrap heap under their management grows to enormous proportions; every slight error in work and every slight mistake in apprehension of an order makes another accretion to the growing pile. Under such foremen the workmen never learn economy of time or of material.

A truly capacitated foreman is a possibility, and his portrait is drawn from no fancy sketch. In the establishment where he is a manager a strike has not occurred since it had an existence—twenty-five years. Probably there are many like him, and his portrait may stand for those of others.

Although he is generally as exact as the workmen to the "bell hour," there is no stir among them if he is late and no letting down of attention when he goes out. He assumes a part of every job and does it, wearing his honorable overalls like his men. He is not afraid of a loss of dignity or a relaxation of authority by addressing his men familiarly. He suffers no diminution of well earned superiority in asking advice of some of his more experienced men. If one of his men "runs against a snag," he goes at once to his foreman, who either knows what to do, or has some proper and timely suggestion to make. He contrives to have his men interested in the work from incipiency to finish, and when one of them shows hearty interest in the work and turns out a good job, he is told of it in plain words that cheer his heart, instead of being rewarded with a grumpy "That'll do."

MACHINE SHOP MANAGEMENT.

"My own idea of a machine shop is that the money made out of it is always made because the mechanical manager of it is sharper than other people. I never knew a machine shop to make money the head of which was not a skillful mechanic. To manage a machine shop a mechanical man with business qualifications is needed."

This opinion is reported from a conversation in which the veteran machinist, William Mason, of Taunton, described himself very accurately. There are competent mechanics, industrious workers, judicious overseers of men, and capable layers out of work, who have had little success financially in the business of conducting a shop. Yet the ordinary observer would suppose that these enumerated qualifications comprehended all that was necessary to success. But there is one other qualification without which all these are of no avail in business; and that is the faculty of conducting a business. This faculty may be considered a natural gift rather than an acquired qualification, but there are living evidences and examples that it may be acquired. It consists, in one phrase, in "the capability of noting details while dealing with general facts."

The manager of a machine shop business ought to be able to sum up, at least once a week, the salient facts of expenditures and income, and he ought to know wherein the improper proportion between them exists, if it does exist. The little daily wastes of oil, of files, of slow feeds, of loose and slipping belts, of temporary tinkering, of fussing about a job, and other unnamed wastes, all using up time and delaying the progress of work—all should be noticed by him. The correction of these slight errors would be sufficient, sometimes, to change the balance sheet at the year's end. Unless he is a good mechanic many of these leaks in the productiveness of the shop would be unnoticed because he could not see them, or seeing them could not understand them or suggest a remedy.

But all these requirements do not comprehend the entire qualifications necessary to the successful manager of a machine shop business. The actual cost of the production of an article, which is usually reckoned by cost of material and cost of time used, includes a large number of items any one of which is subject to occasional variation. For instance it would be folly to fix the same price on an article composed of iron, steel, and work when iron, and steel, and labor were at their highest price as when either one or perhaps all were at a lower price. And yet this fixed price rule has been the method of business of some shop manufacturers who made barely a living profit under the more favorable conditions and suffered heavy losses under the unfavorable conditions.

Paper Gas Pipes.

These are made by passing an endless strip of hemp paper, the width of which equals the length of the tube, through a bath of melted asphalt, and then rolling it tightly and smoothly on a core, to give the required diameter. When the number of layers thus rolled is sufficient to afford the desired thickness, the tube is strongly compressed, the outside sprinkled with fine sand, and the whole cooled in water. When cold the core is drawn out, and the inside served with a waterproofing composition. In addition to being absolutely tight and smooth, and much cheaper than iron, these pipes have great strength; for when the sides are scarcely three-fifths of an inch thick they will withstand a pressure of more than fifteen atmospheres. If buried underground they will not be broken by settlement, nor when violently shaken or jarred. The material being a bad conductor of heat, the pipes do not readily freeze.

DICTATOR, 20 years of age, a celebrated stallion, sire of many fast horses, has lately been sold for $35,000. This horse is of Hambletonian origin, and a brother of the famous Dexter.

A SHAM BOILER INSPECTION.

The boiler of the Hudson River steamboat Riverdale, which exploded August 28 (noted in the SCIENTIFIC AMERICAN of September 8), has been raised, a coroner's jury has made an examination, and rendered a verdict which states that the boiler "ruptured from the insufficiency of the plates in the bottom of the cylindrical shell to withstand a working pressure less than that assigned to them by one of the United States inspectors for this district, in consequence of their having become weakened by internal oxidation from their unusual exposure to the corrosive action of the feed water."

The verdict further expresses the opinion that "the United States law is not sufficiently mandatory in its requirements as to the usual examination of a boiler, so far as it may be practicable; that the pressure test alone is insufficient in its period of application, fallacious, and pregnant with disaster both to human life and property, as is fully evidenced in the case under consideration, namely, this boiler was tested in June last and withstood a pressure of 62 pounds to the square inch, yet in the brief period of less than ten weeks it ruptured under a pressure not exceeding 32 pounds, in consequence of the neglect of observance of its condition at the time of testing it." A censure of the engineer and the United States Inspector was offered, but was not indorsed unanimously.

The boiler had become weakened by reason of corrosion, the original one-quarter inch thickness being corroded so that portions could be broken off by the hand. According to one newspaper report, a supervising inspector said that "the flues would prevent the bottom's being sounded by a hammer to test its strength. A hammer could not reach on the outside either, on account of the low position of the boilers in the boat. Under those circumstances the corroding process would work on unnoticed till the bottom of the boiler became too thin to stand the strain." Another supervising inspector said that "it would take twenty times the number of inspectors to examine thoroughly and test such boilers as this."

Yet it appears that a certificate of inspection was issued, and on this baseless certificate the boat was permitted to run, to the loss of human life and the destruction of property.

An assistant inspector testified that the absence of rivets which had been eaten away by corrosion could have been seen from the front by holding lights at the back, so that the rays could reach the place. The assistant inspector who assumed to have examined the boilers on the 21st of June last, acknowledged, in his testimony, that the boilers were not empty when he examined them! Witness said he did not test the boiler with a hammer, but merely looked at it. Witness acknowledged that in his inspection of the boilers of the Riverdale in 1881–82 and 1883 he never was inside of the boilers, but merely looked into the manhole.

Comment on such testimony is scarcely required. It shows the farcical character of so-called boiler inspections under the present system. A man looks into a boiler the bottom of which is covered with water and the interior dark as Erebus, pronounces the boiler all right, and signs a certificate of safety, and in just two months the boiler bursts and kills half a dozen persons. "Boiler inspection" forsooth!

THE MILDEW OF THE GRAPE.

Closely related to the potato rot fungus, an account of which was given in our issue of September 8, is the mildew upon the grape vine. These two fungi belong to the same genus, the former being known to science as *Peronospora infestans* and the latter as *Peronospora viticola*. The mildew of the grape is much slower in its action, though the general behavior and appearance of the two pests are much alike. The grape mildew makes its first appearance upon the under surface of the grape leaves in the form of small frost like patches. The smooth leaved varieties of grapes exhibit this parasite to much better advantage than those sorts the leaves of which are covered with a dense coat of hairs. These patches of a crystalline appearance consist of the tips of branching threads which come out of the breathing pores of the leaves and bear the summer spores on their many terminations. These spores are formed very rapidly, fall away from their attachments, and are carried by the wind, and otherwise, to new ports and then germinate, thus propagating the mildew. The substance of the grape leaf below the "frosty" patch is interlaced with the threads of the fungus, which branch and send short suckers into the walls of the leaf cells and rob them of their nourishment. The mildew lives upon the stolen juices of the grapevine and thus does its injury. The infested leaves soon turn brown and die unless some measures are taken to destroy the parasite.

The conditions most favorable for the growth of the grape mildew are, a moist atmosphere with bright sunshine. A succession of showers in late June is very apt to result in an abundance of mildew. This season it has been unusually destructive, owing to excessive moisture of early summer. The fungus does not confine itself to the leaves, but spreads to the stems and the fruit. The writer has examined many clusters this season, the berries of which were discolored within when only partly grown; while on the outside they had the attractive color of half ripened fruit. When sections of these prematurely ripened grapes were placed under the compound microscope, they were found infested with the filaments of the grape mildew. The skin of the grape being tough and without breathing pores, prevents the fungus from coming to the surface and forming the summer spores. The diseased grapes cease to grow, become shriveled, and finally drop as worthless masses from the stems.

Some varieties seem to be more injured than others by the mildew. The fungus thrives best on the thin leaved sorts, but none of the varieties, so far as we know, are proof against the pest. Some varieties are more vigorous and perhaps are better able to withstand the attacks of the mildew. The remedy for the mildew on the grape is flowers of sulphur. It should be dusted on or blown on, with a bellows, so soon as the first signs of the trouble may be seen. The sulphur is more lasting in its effects if applied when the foliage is wet, either with dew, in early morning, or with rain. It is important to get the yellow powder upon the under side of the leaves and in contact with the "frosty" patches. It is too late to apply the remedy this season, but all grape growers should make the necessary preparations to meet this enemy upon its first appearance early next summer.

A second form of spore is formed by the mildew and within the substance of the infested part. It results from the union of the contents of two cells, and is of slow growth. These spores are provided with thick coverings of a brown color and do not germinate until the following spring. The sexual spores, as they are called, are most abundant in the foliage in late autumn, and remain in the substance of the foliage until set free by the processes of decay, etc. It is evident that these spores are designed to carry the mildew over the winter season, and may be called *winter* spores in distinction from those found early in the season, which might be designated *summer* spores. Very many fungi have these two forms of spores, and in some the number is increased to five or more.

The leaves of the vineyard after they have fallen should be gathered into piles and burned, and in this way a vast number of the spores within the leaves would be destroyed. This part of the work of checking the spread of the grape mildew may still be done this season. It is a prevention, an ounce of which is worth a pound of cure. The remedy is applied in early summer in the form of flowers of sulphur. Many vineyardists are as careful about "sulphuring" their vines as they are in manuring the ground or gathering the crop. Others are careless of this, and lose by it.

There is another mildew of the grape vine, closely related to if not the same as the fatal *Oidium* of European vineyards.

New Process of Mineral Painting.

A new process of mineral painting, invented by Herr Adolph Keim, of Munich, was lately exhibited in operation and by executed specimens at the Art Training School, South Kensington, London. Mr. T. Armstrong, the art director, explained that when he visited the Art Exhibition at Nuremberg some months since, he saw numerous specimens of this new form of decoration. It was to some extent analogous to distemper painting, and offered facilities resembling those possessed by the antique decorators for the rapid execution of ornamental paintings, scrolls, and arabesques on a surface of gesso or plaster without reflecting the light. The science and art department purchased two large pieces illustrating the process, which were now hung at a proper level in the Architectural Court at South Kensington, and Herr Schraudolph, a Munich artist, had been engaged during the present term to execute work by this process before the students of the National Art Training School.

Some specimens of that work, life-sized studies of female figures and floral decoration executed on canvas, and smaller sketches on tile, glass, slate, and marble surfaces, were exhibited in the room. At the conclusion of Mr. Armstrong's explanation, Herr Schraudolph showed to the audience how the work was done, the outlines being traced on a ground kept moist by a spray, and then filled in with moist colors and fixed by repeated sprays of potash water glass, after which carbonate of ammonia and benzine were applied to the surface. Skill and judgment are needed to insure that the process of fixing is not carried too far, or a troublesome and unsightly efflorescence is formed on the surface similar to that which disfigures the frescoes in the House of Lords.

As to the permanency of the process, Herr Schraudolph stated that some work which had been done on marble ten years ago, and other specimens on canvas two years ago, showed no signs of deterioration at present, but the process was quite a modern one. Mr. Armstrong added that there was no attempt to simulate tapestries, and any development in that direction resembling the dyed fabrics now to be seen in the Bond Street and Regent Street show rooms was to be deprecated. It was equally as effective as tapestry, and, as could be seen from the exhibits, allowed a wide range of color.

The following description of the process has been prepared by Professor Church:

Herr Adolph Keim's process of "mineral painting," although identical in principle with the stereochromy of Fuchs, differs from that process in several important particulars. For the simple mortar, or plaster, of lime and sand generally used in stereochromy as the painting ground, Herr Keim substitutes a composition made by the careful admixture of 4 parts quartz sand, 3½ parts marble sand artificially prepared and free from dust, one-half part infusorial earth, and 1 part quicklime slaked with distilled water. The pigments are admixed with various substances before use, so as to render the action of the fixative solution upon them, when the painting is complete, more uniform.

The pigments are also treated with alkaline solutions (of potash or ammonia) so that any change of hue which might ensue from the use of alkaline liquids in fixing the paintings may be anticipated by treating the paints themselves before use with the same solutions. But not only do the pigments and the materials of the painting ground offer novel features in this process of Herr Keim, but the fixing of the painting with a hot solution of potash waterglass and its subsequent treatment with a solution of carbonate of ammonia differ from the process adopted in stereochrome painting. It should be stated that paintings may be executed not only upon external and internal walls coated with the specially prepared plaster, but also upon tiles, slate, glass, etc., similarly coated, and even upon canvas, which has been washed with baryta water, and is kept moist with a fine spray of distilled water.

The operations of "mineral painting" may be thus summarized: upon an ordinary but perfectly dry mortared surface a coat of the painting ground material is laid without "floating;" a thin coat, but rough and porous, being secured. Then the dry painting ground is soaked with a solution of hydrofluo-silicic acid. When the ground is sufficiently dry to be again absorbent, it is treated with a solution of potash waterglass. The outlines having been traced upon the ground, kept moist with a fine water spray (distilled or rain water), the painting is carried out with the prepared colors, which are kept in glass bottles, in a moist, pasty condition. These colors, it has been before stated, contain certain admixtures, as the hydrates of alumina, magnesia, or silica, oxide of zinc, carbonate of baryta, feldspar, powdered glass. The colors used are those which have been found available for the stereochromic process. The fixing of the picture is accomplished by means of a hot solution of potash waterglass, thrown against the surface by means of a spray producing machine, in the form of a very fine spray. This fixing done, by several repetitions of the process, a solution of carbonate of ammonia is finally applied to the surface. The carbonate of potash, which is thus quickly formed, is removed with repeated washings with distilled water. Then the picture is dried by a moderate artificial heat. Finally, a solution of paraffin in benzine may be used to enrich the colors, and further preserve the painting from adverse influences.

Taking Time.

The annual report of the astronomer in the observatory of Yale College gives some interesting reports of the work in his department of horology for the last year. From these it appears that the American Watch Company, of Waltham, Mass., received 22 Class 1 certificates for watch movements, and next to the highest mark during the year 1883. Barrand & Lunds, of London, stood at 82, and Constantin & Vacheron, Geneva, Switzerland, 85. The observatory furnishes time by signals to the headquarters of every railroad in Connecticut.

To encourage the public confidence in the accuracy of these telegraphic time signals, the custom has been established of furnishing, as a news item to all the newspapers in the State, the mean monthly errors of these signals at 12 o'clock noon. This time is identical with that of New York city.

The report suggests the establishment of a school of horology in this country. The report says:

"A school of this character is no doubt needed by one of our leading industries, and it will not be difficult, should the financial support be furnished, to establish a course of study and manipulation which should lead to a certificate of training and ability in this direction."

Cornelius Whitehouse.

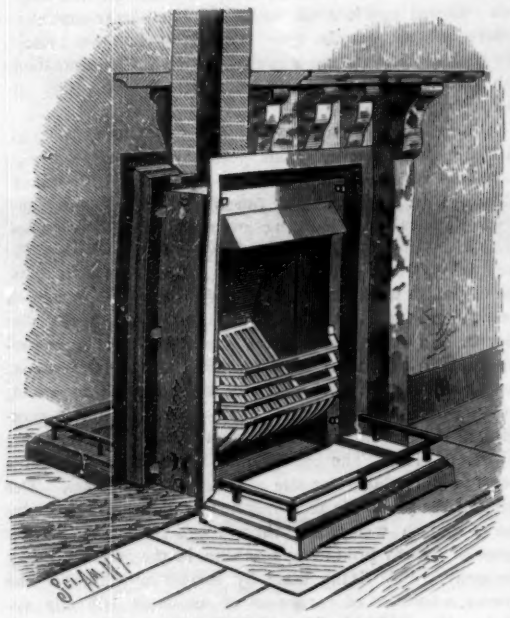
The *Journal of Gas Lighting* announces the decease on the 7th of August last of Mr. Cornelius Whitehouse, the original patentee of wrought iron gas tubes, the manufacture of which is now one of the staple trades of Wednesbury. Mr. Whitehouse was in the 89th year of his age. It may be mentioned in this connection that the bulk of the tubes now made are still manufactured in the manner described by Mr. Whitehouse's English patent, taken out in 1847. In that year he commenced business, trading as Whitehouse & Co., at the Globe Tube Works, Wednesbury; and the trade mark of the firm—the "Globe"—became one of the best known for tubes in England and abroad. In common with most other patentees, the benefits Mr. Whitehouse conferred on all countries through his invention did not leave his latter days with such substantial means as, considering the importance of the industry he created, one could have wished him to have enjoyed.

Coefficients of Friction.

Professor Thurston states that the coefficients of friction of lubricated surfaces under pressure, as given in text books, are much too high; instead of 4 to 7 per cent, as stated therin, he has obtained as low as one-fourth of 1 per cent with sperm oil. This, he says, is the best he ever found for heavy pressures, and he has made experiments all the way from very light up to 1500 pounds per inch of surface. The crank pins of beam engines on steamboats, where a thousand pounds pressure to the square inch is not uncommon, run as low as one-half of 1 per cent for the friction.

Cochin China Grapes in California.

A great number of experiments are being made in California with the seed of the Cochin China grape vine. Seed has been distributed among 800 persons in various parts of the State, and no pains will be spared to acclimate this vine on the Pacific Coast. In its native state it has been found in altitudes varying from 100 to 3,000 feet above the sea level, producing everywhere an enormous crop of fruit. With proper care, authorities in grape culture believe that the Cochin China variety can be grown in all the wine regions in California, and on the Pacific Coast. A vine similar to this, but more vigorous and productive, was lately



IMPROVED GRATE.

discovered on the coast of Guinea by Senor Arpore, chief of a scientific mission sent to that country by the Portuguese Government. The plant was found to be about 4 feet high, with a crop of grapes varying from 90 pounds to 100 pounds on each vine. The fruit was delicious, and the wine made from it was found to be very good, rich in aroma, in color, and in alcohol. A report is being prepared on the subject for the Portuguese Government. The Soudan and the Guinea annual tuberous vines are of the same class as the Cochin China, but the first is a dwarf, and the second little better, as compared with the last named. In Cochin it grows in some forests as high as 100 feet, climbing up and around lofty trees, or stretching itself on the soil, and in some places the vine becomes a wonderful mass of large clusters of luscious grapes from top to bottom.

Spontaneous Ignition of Coal.

The causes of the spontaneous ignition of coal have been much inquired into, and several theories propounded thereon. Durand, among others, has maintained that the presence of pyrites in the coal is a principal cause of this trouble; while, on the other hand, the same result has been shown to have been caused even more frequently by the oxidation of the coal itself. This view of the case is confirmed by Fayol's experiments, recorded in *Dingler's Polytech. Journal*. The absorption of oxygen by coal is affected by the temperature, and the fact of the coal being more or less finely divided. Lignite in the state of fine dust inflames at 150°, and gas carbon at 200°, coke at 250°, and anthracite at 300° and upward. On heating a mixture of finely powdered coal and pyrites to 200° for a period of four days, the coal took up 6 per cent of oxygen, while the pyrites absorbed only 3·5 per cent. From this it appears proved that coal absorbs oxygen much more energetically than pyrites. This is also confirmed by another experiment, in which about 900 grammes of powdered coal and 3,350 grammes of powdered pyrites were placed in tin cans, and dried in a hot chamber. Up to 135° both materials behaved similarly; but afterward the temperature of the pyrites remained almost stationary, while that of the coal rose very quickly, until, after a few hours, ignition took place. Two other samples of coal and pyrites were then put into a chamber heated to 200°, when the temperature of the coal quickly increased. In forty minutes the coal took fire, while the pyrites had in the same time only risen to 150°. Thus the ignition of the coal was not at all hastened by the admixture of pyrites.

THERE have been a great number of earthquakes in Great Britain from time to time. The last of note was that of 1816. It extended over a vast area of country, and in some localities its effects were scarcely felt. The lakes of Cumberland and Durham and those of Scotland were visibly agitated.

IMPROVEMENT IN HEATING GRATES.

In fire grates, as commonly constructed, only a small proportion of the fuel burned is effective in heating the apartments in which they are located. Much of the heat goes up the flue, and a large proportion of it is conducted away by the wall or chimney in which the grate is placed.

Captain J. H. Burnam, of Fayetteville, Tenn., has devised and patented a plan for utilizing the heat that was formerly wasted at the back of the grate, and we are informed that he has been successful in heating two rooms with the fuel usually consumed in an ordinary grate for heating one. This important result is secured by placing in the wall a square casing connecting two adjoining rooms and communicating at the top with the chimney. In this casing is placed a curved fire-back, whose concave side receives the inclined grate upon which the fire is built. The convex side faces the adjoining room and forms an efficient radiating surface. A register is placed in front of this surface to regulate the temperature of the room by screening the plate more or less, and reducing the circulation of air across the plate.

The fire-back is reversible, and the grate may be placed in either room at pleasure. There are at the sides of the iron casing air or ash flues. The chimney required for this grate is very simple and inexpensive, as compared with that of an ordinary one, and the improved article, with fire-back and fittings, is less expensive than the grates of the usual form that would be required to do the same amount of heating.

According to the figures of the inventor, one-half of the fuel, and about half of the expense of putting in the grate and building the chimney, is saved by this improvement. The mantel, hearth, and grate may be of any desired character.

Fig. 1 is a vertical transverse section of the grate, and Fig. 2 is a perspective view with parts broken away to show the construction.

IMPROVED TEXTILE FILTER.

Numerous coffee pots and filters have been used for extracting the entire strength and aroma from coffee, but the results obtained have not been perfect, for if the coffee is ground very fine the decoction is muddy, and if the ground coffee is coarse, the hot water cannot extract all the strength and aroma from the coffee. The textile filter manufactured by the New York Textile Filter Company avoids the above difficulties, and filters coffee, as well as other liquids, to perfection.

This improved filter is shown in the annexed cut, the middle figure showing it used in a coffee urn, the right hand figure showing the manner of filtering the coffee, and the left hand figure showing the filter and coffee pot combined. The filter consists of two cones, the smaller resting inside the larger, and firmly holding the textile fabric. The greater the pressure, the more securely the fabric is held.

The coffee used must be pulverized or ground very fine, and is placed within the filter; the filter is then placed within the pot or urn, and boiling water is poured into the filter. As the filtering fabric or muslin is at the bottom of the cone, the entire volume of water above the filtering fabric exerts a pressure and forces the liquid through the sides and bottom of the inner cone, the apertures in the inner cone preventing the clogging of the filter. As the coffee is not boiled, it will not have the bitter taste of the decoctions usually called coffee. The filter is made in three sizes, which are adapted to fit any tea or coffee pot, and can readily be removed and taken apart for thorough cleaning. It can also be used for filtering water, drugs, liquor, jellies, milk, and lemonade. It is made of planished metal, glass, and porcelain. Made in glass, it is very valuable for filtering drugs and chemicals. It is patented in this country, also in England, Canada, France, Germany, and Belgium.

It is manufactured and sold by the New York Textile Filter Company, 46 Murray St., New York city.

TEXTILE FILTER, COFFEE POT, AND URN.

A Submarine Balloon.

During the forthcoming International Exhibition at Nice the submarine observatory of M. Toselli will be in use in something the same way as the captive balloon at the Paris Exhibition of 1878. It is made of steel and bronze to enable it to resist the pressure of water at a depth of 120 meters, nearly 160 pounds to the square inch. The vessel is divided into three compartments, the upper for the commander to enable him to direct the observatory, and give explanations to the passengers, who, to the number of eight, occupy the middle compartment. They have under their feet a glass plate, enabling them to see the bottom, with its corals, fishes, grass, etc. The third compartment contains the buoyant

IMPROVED GRATE.

chamber, and can be regulated at will. As the sea is dark at the depth of 70 meters, the observatory is to be lighted by electricity, and a telephone communicates with the surface.

Discovery of a Telescopic Comet.

Mr. William R. Brooks, of the Red House Observatory, Phelps, N. Y., says that on September 1, 1883, he discovered a telescopic comet in the constellation Draco, right ascension 16 h. 35 m., and north declination, 64° 5'. The comet is faint, without tail, and has a small, sparkling nucleus.

"It has been my fortune," says Mr. Brooks, "to discover the first and only two comets, thus far, of 1883. This last one was discovered with the aid of a nine inch reflector, which, like all my astronomical instruments, is of my own manufacture."

Photo Zinc Lithographic Plates.

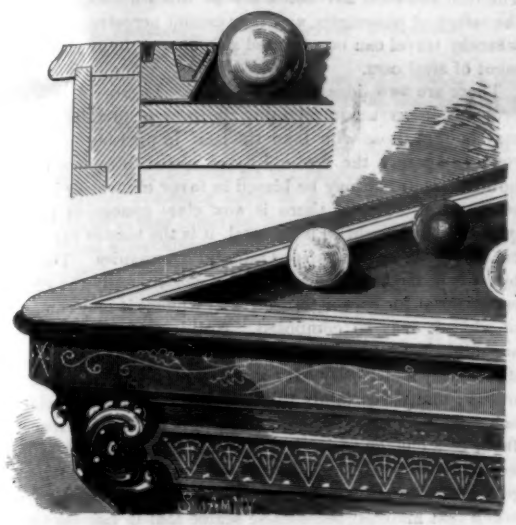
In the office of the French Minister of Public Works, charts and plans are prepared by a process of photo-zincography. The *Bulletin de la Societe d'Encouragement* thus describes it: A plate of commercial zinc is chosen which is free from defects. In order to cleanse it thoroughly it is rubbed with a stiff hair brush which is dipped into a mixture of one third sulphuric acid and two-thirds water. After this cleansing, which removes every trace of oxidation and grease, the plate becomes very brilliant, and it is rubbed for some minutes with a cork dipped in powdered pumice stone. It is then washed and plunged, for ten or fifteen minutes, into a bath acidulated with 3 per cent of nitric acid. The plate then has a dull look and shows a slight roughness under the microscope. After having carefully dried it, it is covered by a preparation composed of 10 liters of water and 500 grammes of crushed nutgalls. After boiling this preparation until it is reduced about one-third, it is cooled and filtered through linen; then are added 100 grammes of common nitric acid and 6 grammes of pure chlorhydric acid. After the preparation has been left in contact with the plate for some time it is washed and dried, and then coated with bitumen in the ordinary manner, and exposed to the light under the drawing which is to be copied. When the exposure is over, the plate is warmed slightly and developed with the addition of a liquid containing 5 per cent of acetic acid. To facilitate the inking, it is well to apply to the lines some oil, which destroys their brilliancy and turns them gray. Then, after a careful drying, the bitumen is dissolved by benzine, and the plate is again dried. It can then be delivered to the printer, who submits it, without any precautions, to the ordinary operations of lithography for inking and printing.

A WRITER in one of the medical journals says he has found the application of a strong solution of chromic acid, three or four times a day, by means of a camel's hair pencil, to be the best and easiest method for removing warts.

IMPROVED BILLIARD CUSHION.

This is a rubber cushion having embedded in it a ribbon of spring metal for imparting to the cushion an increased and uniform elasticity throughout. The inventor has ascertained that the best spring is made of roll-tempered brass cut straight from the sheets. The metallic ribbon is fitted in a socket of hard rubber or other appropriate material, and its upper edge extends nearly to the face of the cushion, as shown in the sectional view.

The inventor claims that by using roll-tempered brass he is able to produce a superior billiard cushion at a reduced expense, as compared with cushions having the spring made of tempered steel, as straight fire-tempered springs cannot



MAY'S BILLIARD CUSHION.

be produced, and they are not so well suited to the purpose as rolled brass springs.

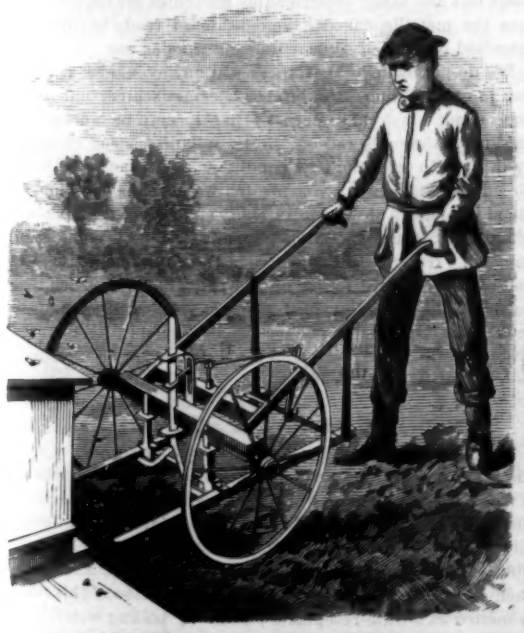
This invention has been patented by Mr. Samuel May, of 81 Adelaide St. West, Toronto, Canada.

Improved Electric Light.

It is reported that M. Tommasi has made an important improvement in the Jablochkoff electric candle, by rendering the luminous point practically stationary. The candle, it is well known, burns down, and the luminous point is *lowered* steadily through the hour and a half or two hours *during* which the candle lasts. This is not a defect of much moment in the lamps on the Thames Embankment; but M. Tommasi has devised a selenium regulator which receives the light from the candle and acts as an automatic elevator of the luminous point. M. Tommasi has also been endeavoring to utilize the peculiar properties of selenium in photometry and telegraphy.

A CONVENIENT LEVER HAND CART.

The engraving shows a very compact, convenient, and handy truck or hand cart, designed specially for the transfer of beehives without disturbance of their industrious inhabitants, but also equally well adapted to other uses in which the ordinary wheelbarrow, the platform truck, and the simple hand cart are employed. The great advantage of this truck is that it carries its load low under the axle, and that loading and carrying and dumping are performed with little effort, the load being on nearly the same level in all the operations.



THOMPSON'S BEEHIVE TRUCK

The engraving shows the construction of the truck and the manner of its use. Under the axle are suspended two bars which project forward and form the carrying part. This frame is pivoted to arms depending from the handles, and is suspended from the axle by a central upright that, by means of guides on each of its two spread ends, controls the vertical movement of the bars. This movement is controlled by the operator by means of a lever in front of him.

After the load is taken on, the lever may be fastened by a hook. The large wheels and the adjustable carrying bars give this truck an advantage over the ordinary small wheeled and rigid truck.

Charles R. Thompson, Fort Omaha, Douglas County, Nebraska, is the patentee of this invention, and communications should be addressed to him for any further information on the subject.

The First Electric Telegraph.

The idea of the practical application of the electric telegraph to the transmission of message was first suggested by an anonymous correspondent of the *Scots Magazine*, in a letter dated Renfrew, February 1, 1753, signed C. M., and entitled "An Expeditious Method of Conveying Intelligence." After very considerable trouble, Sir David Brewster identified the writer as Charles Morrison, a native of Greenock, who was bred a surgeon, and experimented so largely in science that he was regarded in Renfrew as a wizard, and eventually found it convenient to leave that town and settle in Virginia, where he died. Mr. Morrison sent an account of his experiments to Sir Hans Sloane, the President of the Royal Society, in addition to publishing them anonymously as stated above. The letter set forth a scheme by which a number of wires, equal to the letters of the alphabet, should be extended horizontally, parallel to one another, and about one inch apart, between two places. At every twenty yards they were to be carried on glass supports, and at each end they were to project six inches beyond the last support, and have sufficient strength and elasticity to recover their situation after having been brought into contact with an electric gun barrel placed at right angles to their length about an inch below them. Close by the last supporting glass a ball was to be suspended from each wire, and at about a sixth or an eighth of an inch below the balls the letters of the alphabet were to be placed on bits of paper, or any substance light enough to rise to the electrified ball, and so continued that each might resume its proper place when dropped.

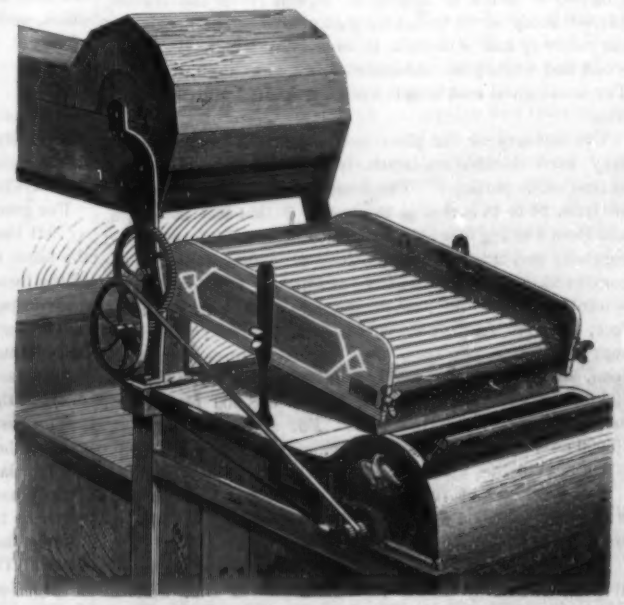
With an apparatus thus constructed the conversation with the distant end of the wires was carried on by depressing successively the ends of the wires corresponding to the letters of the words, until they made contact with the electric gun barrel, when immediately the same characters would rise to the electrified balls at the far station. Another method consisted in the substitution of bells in place of the letters; these were sounded by the electric spark breaking against them. According to another plan the wires could be kept constantly charged and the signal sent by discharging them. Mr. Morrison's experiments did not extend over circuits longer than forty yards, but he had every confidence that the range of action could be greatly lengthened if due care were given to the insulation of the wires.—*Engineering.*

IMPROVED FEEDER FOR COTTON GINS.

We give an engraving of an improved cotton gin feeder recently patented by Mr. Andrew L. Stielenroth, of Natchez, Miss. Feeders as usually applied to cotton gins are placed so far forward as to obstruct the mouth of the feed box, so that convenient access to the gin proper for cleaning the brush and the grate is prevented.

This feeder is calculated to improve the connection between the feed box and the feeder. The gin stand, feed box, and feeder are of ordinary construction and arrangement, except that the feeder is set back on the stand a suitable distance, instead of being placed with its discharge end over the mouth of the feed box as usual.

An endless apron of jointed slats is carried by rollers which are journaled in side bars, the shaft of the rear roller passing through hangers that depend from the feeder, so that the rear end of the apron is supported in position for receiving the cotton from the feeder. The shaft of roller also carries a pulley for receiving power and cause the movement of the apron, and the apron being thus hung on the axis of its driving roller, it can be raised and lowered without disconnecting the power. The forward end of the apron terminates above the mouth of the feed box, and is supported so that the height of the apron may be regulated at will. The front roller of the apron is made adjustable for tightening the apron, and the side bars project above the sides of the apron for retaining the cotton.



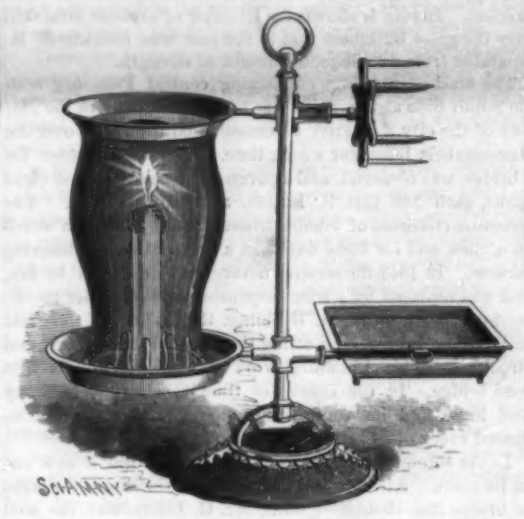
STIETENROTH'S FEEDER FOR COTTON GINS.

By this construction the cotton is fed to the gin by the apron, which can be readily raised to give access to the brush and grate, and for raising the breast board of the gin. The endless apron has its slats closely jointed together, and this prevents the bolls that escape between the carrier and picker roller of the feeder from dropping upon the gin, and prevents the sifting of sand and dust from the cotton upon the boxes and journals. By thus arranging for the convenient cleaning of the brush and grate the danger of fire from neglect of that work is much lessened.

RHODE ISLAND and Delaware together are smaller than the Yellowstone Park.

NOVEL CANDLESTICK, BROILER, ETC.

The engraving shows a novel combination of devices recently patented by Mr. C. B. Tuckfield, of Salt Lake City, Utah. A candlestick, a matchsafe, a toaster, and a broiler are combined in this article. The base is hollowed out to form a receptacle for matches. The vertical rod supports two cross arms, movable up and down on the rod, and held in position by springs and friction blocks. The lower cross arm carries upon one end the candle holder and upon the other end a pan for catching the juices of meats cooked on the broiler. The upper cross arm carries a pan upon one end and a revolving toasting or broiling fork on the other end. The upper pan has a central hole which is located



TUCKFIELD'S CANDLESTICK.

directly over the spring candle socket in the lower pan, and answers as a guide to the candle and as a retainer of any grease or paraffine that may drip. The candle socket has holes in the bottom so that the last end of the wick may draw up whatever remains of the material of the candle, and insure the burning of the whole. When it is desired to use the candle for heating purposes, a glass lamp chimney or a cylinder of wire gauze is placed between the upper and lower pan to protect the flame from draughts of air.

The broiling fork is made to turn over the pan below, and the pan is provided with a wire cloth tray to catch cinders and ashes, and prevent them from mingling with the juices of the meat which drop to the pan below. When the device is used as a broiler or toaster, the candle and chimney, also the matches, must be removed.

A Railway Tunnel under an Iron Mill.

The last stroke of work on the big tunnel, 1,650 feet long, under Jones & Laughlin's Iron Works, Pittsburg, has been completed. The tunnel was constructed by the Vanderbilt, Pittsburg, McKeesport, and Youghiogheny Railroad. Its cost will be $500,000. Over six hundred men were employed on it for a year. The tunnel is one of the engineering feats of the day. The roof is only a few feet below the top of the mill floor, where massive rolls, hammers, and hundreds of men were working. The mill is the largest single mill in the United States, and none of the buildings was injured, and work was not delayed an hour. The ground through which the tunnel passes was mill cinder and slag. For over one hundred feet the slag was so hard it could not be blasted. Heavy weights were dropped on it, and the broken pieces buried in holes where they fell, as they could not be moved, the masses were so large. The road opened for a distance of sixty miles on Sunday for freight traffic.

NEW BRIDGE AT PITTSBURG, PA.

Our engraving represents the new bridge lately completed at Pittsburg, Pa., over the Monongahela River. Our picture is made from an excellent photograph by S. V. Albee, for a copy of which we are indebted to Mr. Alex. Y. Lee, C.E., of Pittsburg; and the engineer of the bridge has favored us with the following particulars, which were originally published in the *Sunday Traveler:*

The new Monongahela bridge, stretching from Smithfield Street on the north shore of the river to Carson Street on the south, by its graceful curves, solid stone supports, and light yet powerful steel cables and girders, challenges alike the admiration and wonder of the spectator—for wonderful it is that so much solid strength can be contained in a structure that appears almost fairy-like in its ethereal grace and slenderness. Herein is shown the triumph of architectural skill over the gross bulkiness that in the past was considered inseparable from an adequate amount of strength.

The need of a bridge connecting central Pittsburg with the South Side at this point was recognized early in the history of the city. A ferry accommodated the travel over the Monongahela River for a long time. In 1810 a charter for a bridge was obtained, and a covered wooden bridge of eight spans, each 188 feet in length, was built in 1816. The structure consisted of wooden trusses, re-enforced with wooden arches, and for those days was a remarkable engineering success. In 1845 the superstructure was destroyed by fire, and was replaced by a wire suspension bridge, under the direction of Mr. John A. Roebling, the builder of the great East River bridge, connecting the cities of New York and Brooklyn. This Pittsburg work was W. Roebling's first road bridge. In the course of time it became very shaky and loose, and its continuous swaying and creaking convinced every one that it was becoming unsafe for travel.

In the summer of 1880 it was decided to build a new one in its place. After a good deal of discussion as to the kind of bridge that should be built, Mr. G. Lindenthal, the well known engineer, was invited to prepare plans for a bridge that would not be subject to undulations and would be capable of enduring the constantly increasing traffic without limitation of load or speed.

His plans were accepted, and in 1881 the work was commenced.

The Lindenthal bridge is of the kind known as the Pauli truss. It rests on seven stone piers, and has two cast iron towers, 123 feet from low water, very massive and elaborately ornamented. The full length of the bridge is 1,221 feet. The two main spans are each 360 feet; the north approach is 320 feet from Water Street to the first large span; and from the toll house to the span, 208 feet. On the south end the distance from the toll house to the first large span is 290 feet, and from Carson Street 515 feet. From the roadway of the center span to the river at low water it is a distance of 61·08 feet, and from the under side of the floor, 57·08 feet. The old bridge left only 36·03 feet clear between the water and its lower side.

The roadway at present is 22 feet 10 inches wide in the clear, and the two sidewalks are each 10 feet in the clear. The full width of the bridge on the deck span approaches is 43 feet 6 inches, and on the channel spans, which are through spans, 48 feet. The bridge can be widened out, should it ever prove necessary, to 64 feet. The use of steel instead of iron wherever possible was based on the grounds of economy as much as anything, especially in the trusses, $31,600 being saved by taking that course. The flooring of the roadway and sidewalk is preserved wood, viz., gumwood and white pine, submitted to the zinc tannin process. The ornamental cast iron towers are roofed with wrought iron.

The masonry of the piers and approaches consists of a gray, hard, durable sandstone, free from admixture of clay or iron oxide particles. The dimensions of the stones used are from 24 to 16 inches in thickness, 7 to 4 feet in length, and from 3 to 1¾ feet in width, with beds and joints dressed regularly and true. The quantities of material used in the construction of the bridge were as follows: For foundations —lumber, 594,000 feet, board measure; piles, 10,800 lineal feet; concrete, 1,280 cubic yards; iron, 322 tons; stone masonry, 10,500 cubic yards. For superstructure—iron, 1,070 tons; steel, 740 tons; cast iron of towers, pedestals, etc, 196 tons; preserved lumber for floor, 358,000 feet, board measure; steel rails, 134 tons. For approaches—filling, 10,000 cubic yards; sidewalk pavements, 1,400 square yards; street pavements, 2,200 square yards.

The total cost of the bridge is $458,000. The bridge is strong enough for a double track railroad bridge of modern standards.

Messrs. Kloman, of the Superior Mill, furnished the forged steel bars for the chains; Shoenberger & Co., and the Spang Steel Company, of Sharpsburg, all the steel required; Graff, Bennett & Company, the iron; and Jones & Laughlin, the cast iron pedestals, steel pins, and other thousand and one articles of metal used in the great work. The lumber was from the St. Louis Wood Preserving Works. The masonry was put in by Jacob Friday. Kellogg & Maurice, of Athens, Pa., built the two large spans. C. J. Schultz, of the Iron City Bridge Works, was contractor for the approaches. Morris & Marshall erected the portals or towers that are such prominent and beautiful objects on the roadway of the bridge, and make triumphant entrances to the main portion of the structure. Booth & Flinn took care of the brick and block stone paving, as well as the curbs and sidewalks. The entire work was done under the immediate supervision and from the plans of the chief engineer, Mr. Gustavus Lindenthal. Mr. J. R. Meredith superintended the construction of the work after the erection of the channel spans.

Many people have wondered how the work was arranged so that there was no stoppage of travel over the old bridge, while the new one was in course of erection. It was only by the exercise of considerable skill and thorough knowledge of engineering possibilities that this was successfully accomplished. The first of the old bridge that was removed was the north anchorage. To hold up the suspension bridge a temporary anchorage had to be constructed at the second pair of towers. This was done by means of cable grapplers and adjustable anchor chains, so as to transfer the strain to the same gradually, while travel on the bridge was going on as usual. The erection of the new bridge having been planned to be effected without interfering with travel on the old one, the superstructure was designed accordingly.

The bridge is owned by a stock company, of which Dr. D. Hostetter is president.

Some Hitherto Undeveloped Properties of Squares.*

BY O. S. WESTCOTT, OF CHICAGO, ILL.

The paper began by ascribing due credit to a method for obtaining squares and square roots, described by Samuel Emerson in 1865. The principles and details of that method were briefly summarized. Mr. Westcott then stated the general principles of his own method, which is very expeditious. He first shows that the tens and units figures of all perfect squares of numbers, from 26 to 49 inclusive, are the same as the tens and units figures of perfect squares of numbers from 24 to 1 inclusive. A table is presented as follows:

$(24)^2 = 576$, add 100, $= 676 = (26)^2$
$(23)^2 = 529$, add 200, $= 729 = (27)^2$
$(22)^2 = 484$, add 300, $= 784 = (28)^2$

and so on, to

$(1)^2 = 1$, add 2400, $= 2401 = (49)^2$

To determine the square of any number between 25 and 50 find the corresponding number below 25, and augment its square by the number of hundreds indicated by its remoteness from 25. Or, more conveniently, take the excess above 25 as hundreds, and augment by the square of what the number lacks of 50.

Thus:

$$(43)^2 = (43 - 25) \cdot 100 + (50 - 43)^2$$
$$= 1800 + 49 = 1849.$$

Conversely: To obtain the square root of 1764. The root is plainly between 25 and 50. The tens and units figures indicate 8. Therefore the square root of 1764 is $50 - 8 = 42$.

It is further observable that the tens and units figures of perfect squares of numbers from 51 to 99 inclusive are the same as the tens and units figures of the squares of numbers from 49 to 1 inclusive. Since $4\times$ any number of hundreds $+ 25$, 50, or 75 gives an exact number of hundreds, it follows that the tens and units figures of the squares of numbers less than 25 represent all the possible combinations of figures in those orders of units for *all* square numbers. The terminations of all perfect square numbers are 22 in all: viz., 00, 01, 04, 09, 16, 21, 24, 25, 29, 36, 41, 44, 49, 56, 61, 64, 69, 76, 81, 84, 89, 96.

The following rule is then deduced: To square any number from 50 to 100, take twice the excess above 50 as hundreds, and augment by the square of what the number lacks of 100.

Thus:

$$(89)^2 = 200\,(89 - 50) + (100 - 89)^2$$
$$= 7800 + 121 = 7921.$$

Conversely, $\sqrt{3249}$: The root is plainly between 50 and 60; the tens and units figures indicate 7; therefore $\sqrt{3249} = 50 + 7 = 57$.

For greater convenience it is noted that in such a case as $\sqrt{7921}$ the root is $50 + 39$ or $100 - 11$, and it is easier to use the latter form. That is, if the root is in the fourth quarter of the hundred, subtract the number indicated by the tens and units from 100, and the difference is the root. Thus $\sqrt{8281} = 100 - 9 = 91$.

To square any number from 100 to 200, take four times the excess above 100 as hundreds and augment by the square of what the number lacks of 200.

To square any number from 125 to 250, take one-half the excess above 125 as thousands and augment by what the number lacks of 250.

By a series of steps of this character the author gives methods for squaring higher numbers and conversely for obtaining their square roots. A choice of methods is also indicated. The facility which was obtained by such means was deftly illustrated on the blackboard by the author, who in a few seconds performed such exploits as raising 5 to the 16th power, and then showed in detail the processes which he had mentally executed. The paper sets forth the reason for each rule, deducing it from the usual binomial theorem, with almost obvious simplicity

The demonstrations were received by the section with hearty applause. In response to an inquiry, Mr. Westcott stated that he had been very successful in teaching this method in classes, about a tenth of his pupils becoming rapid experts in the methods of solution, which were especially useful in handling quadratic equations, and determining at a glance whether a given number is or is not a perfect square.

* Read at the recent meeting of the American Association.

Metallic Cars.

Since the close of the Chicago Exposition certain of our contemporaries have been blaming master car builders for their conservatism or lack of enterprise in not having exhibited for public inspection cars made of iron or steel. The Master Car Builders' Association also comes in for a share of reprehension in not urging forward with energy and zeal the change from wood to metal. The claim is advanced that iron or steel will be used in car construction at no distant day, even from the humble coal car to the luxurious drawing room coach. When the interests or prejudices of people lead them to desire a change in any practice or principle, they do not generally search long before finding plausible reasons for demanding what will satisfy their wishes. The iron and steel advocates are at this time solicitous for the safety of passengers, and they cannot perceive any means whereby travel can be rendered safe except by the employment of steel cars.

There are two sides to this question. Lumber dealers are probably interested in retaining the present practice, and it may be that those who take the lead in pressing upon railroad companies the desirability of abandoning wood as a building material may be biased in favor of steel or iron by self-interest. But if there is any class concerned in this matter which ought to be neutral, it is the master car builders employed by the various railroad companies. Their interest is in the best, the safest, and consequently the cheapest material for cars, irrespective of whence it may come and of what it may be composed. Nothing that has yet been accomplished by iron or steel in the way of car building indicates any superiority over wood or even paper for general utility; and we certainly think the Car Builders' Association acted wisely in refraining from pledging their influence in favor of a change which is yet experimental. There will be nothing lost by waiting till investigation and experiment prove what is really most suitable as a substitute for wood when that material becomes so scarce that it can no longer be used economically in car construction.

Only in one respect can the friends of steel make a decided point for that material over wood, and that is its immunity from taking fire in case of accident. We believe this danger from fire has been exaggerated, for where the floors of a car are filled with a non-combustible substance and safety stoves and lamps are used the chances of a car taking fire are very remote. Metallic cars would not be absolutely free from this danger, as the lining would necessarily be of wood. As a car building material, iron or steel has certain objectionable features which must not be overlooked. In summer metallic cars would have a tendency to be intolerably hot, for no amount of non-conducting material could prevent the heat of the sheets from being conveyed inside the car. In winter, on the other hand, the temperature of the metal would always be lower than the air inside the car, and continual "sweating" would ensue with all the discomforts of dampness and water-saturated lining. This condition of affairs would be calculated to reduce the life of a steel car considerably below the period usually calculated on. There is another objection to metallic cars which will occur to any one who has traveled on an empty tender. That is, the noise produced by the vibration of the iron sheets. Means of deadening this discomforting sound could probably be devised; but years of patient labor and experiment to overcome this and other objectionable attributes are required before the metallic car can be considered ready to fulfill its promised mission of superseding the wooden car.

We do not believe that there will be any sudden revolution in car building. As lumber becomes scarcer and more expensive, metal, and perhaps paper, may be worked in gradually, the tools and building appliances being changed by degrees to meet the new conditions. Iron and steel have already worked into favor for trucks, but the adoption of metal has been a slow process, every step being accomplished after experiments made to ascertain the best methods of using it. Iron or steel sills may be the next step in progress, and other parts will follow on the metallic base when that becomes the cheapest medium; but we do not anticipate seeing the body of passenger coaches made of a material which conducts heat and cold so readily as does iron or steel. —*National Car Builder.*

Medicated Gelatine in Skin Diseases.

Prof. Pick, of Prague, has recently advocated a new method of applying remedies to diseased skin. He melts in a water bath some pure white gelatine in twice its weight of distilled water, and while keeping up an incessant agitation adds the quantity of medicinal substance—*e. g.*, chrysarobin, iodoform, salicylic or phenic, and pyrogallic acids, and then allows the mass to cool. For use a portion of this mass is melted in a little receptacle placed in boiling water, and is then applied to the diseased skin by a camel hair brush. It presently sets and compresses the skin; but unless smeared over with a little glycerine, in the proper use of which some little experience is needed, the gelatine is apt to crack and fall off. In this way Pick has obtained good results in psoriasis by the application of a gelatine containing 10 to 20 per cent of pyrogallic acid, or 10 per cent of chrysarobin, after a thorough washing of the parts with potash soap in a warm bath. In severe cases he renews the applications every two days. He has also successfully employed gelatine medicated with 5 to 10 per cent of salicylic acid in the squamous stage of chronic eczema, and some erythematous conditions, and in pruritus. The gelatine is easily removable by washing.

Correspondence.

Sounds Heard at Great Distance.

To the Editor of the Scientific American:

Relating to long distances at which sounds have been heard, a gentleman states he has heard the cars crossing the bridge at the town of Wareham, Mass., sixteen miles away across Buzzard's Bay, he being at Falmouth, Cape Cod. This was on a cool autumn evening, with no wind. The sound was quite distinct and noticed by others.

Query: Are such sounds more readily transmitted than those of whistles, etc.?

H. W. HUBBARD.

New York, September 12, 1883.

The Inventor of the Screw Propeller.

To the Editor of the Scientific American:

Several articles upon the invention of the screw as a ship propeller induce me to remark that it is due neither to Ericsson nor to Griffith nor to Ressel. It is the well known *Wiebeking* who first used it during the last century, in a small screw propeller boat on the Rhine. It is true that his motive power consisted only in a few men, and that the screw found at that time no general application, owing to the want of a suitable power. Nevertheless the invention is in no way connected with the motive power used, and it is therefore *Wiebeking* to whom the navigating world is indebted for the important invention of the ship screw.

WERDUN.

Vienna, August 22, 1883.

"Storage of Wind Power."

To the Editor of the Scientific American:

Your remarks about the system of weights and springs in the issue of September 8, 1883, is just what I expected, nor do I come forward to solve the question; but I would suggest that it might be possible to secure some benefit from wind power by having the wind-wheels operate pumps to raise water into a higher reservoir, and then you are dealing with a commodity which can be much better controlled than a heavy system of weights.

If the supply of water is limited, the same water may be used over and over.

J. P. M.

The Storage of Wind Power.

To the Editor of the Scientific American:

In your issue of the 8th of September you seem to invite further discussion of the problem of storing the power of the wind. This is a question I have had occasion to consider frequently in the last thirty years. It is quite possible to store the power of the wind in locations where nature has already made the necessary preparations, or so nearly so that they may be completed without too great outlay of money.

The requirements are two large reservoirs or ponds of water nearly contiguous, one at a higher level than the other; a powerful pumping windmill, or a number of them, to raise the water from the lower to the higher reservoir; the power to be utilized to be obtained from turbines operated by the return of the water to the lower level.

A large surplus of wind power would have to be provided to make up for evaporation and probable leakage in practice. There are water mills which might be benefited by pumping windmills to raise the tail water to the forebay. As to the financial success of this plan, that is not considered in this article.

Whoever can produce a better device than this for the object in view would probably confer a benefit upon mankind by making it known, and on himself by obtaining a patent for the invention.

HENRY S. AKINS.

Speedsville, N. Y., September 9, 1883.

Peculiar Case of Spontaneous Combustion.

To the Editor of the Scientific American:

A case of spontaneous combustion came to my notice lately, occurring under such peculiar circumstances that I deem it my duty to communicate the facts. The circumstances of the case, briefly, are as follows:

On the 24th of August smoke was discovered in the scale department of the machine shop of Wm. Stormont, of Ottawa, and proved to proceed from a piece of timber being used in the construction of a wagon scale.

A 2 x 8 plank of pitch pine resting on supports about 8 inches from the floor was smoking, and inspection showed a knot about seven-eighths of an inch in diameter, on the under side of the plank, with the wood surrounding it, to be badly charred for a quarter of an inch in depth, while the plank in the vicinity of the knot was quite hot.

There was no fire in the room and apparently no chance for the wood to take fire by ordinary means, as the charred spot was on the *under* side of the plank, while the floor beneath showed no trace of fire. The plank was near a window on the west side of the room, and the fire was discovered about 5 P.M., so the sun had doubtless been shining on it, but there was nothing to concentrate its rays, and nothing on the floor beneath to reflect them upward, even if so concentrated.

The phenomenon was seen by a number of competent witnesses, and is the most remarkable of the kind I ever heard of. If a piece of pine may take fire of itself, many a mysterious fire might be accounted for, and builders would do well to exercise care in selecting their material.

J. A. GREEN.

Dayton, Ill., Sept. 3, 1883.

The Riverdale Steamboat Explosion.

To the Editor of the Scientific American:

I wish to make a few remarks in regard to the disaster on the steamboat Riverdale. Anything that would help to guard against such disasters should be interesting to the readers of your valuable paper. I was in New York city on the 6th inst., and went to see the boiler after it was in the dock. I do not propose to give my opinion as to the cause of the explosion, but to try and guard against such disasters. I would have the draught from the furnace return under the shell of the boiler before it went into the chimney, thereby securing a more uniform expansion of all parts of the boiler, and preserving the bottom of the boiler from rust caused by the dampness of the bilge water.

By the present way of setting up boilers there is no heat under the boiler, and of course the top of the boiler is expanded and contracted every time you get up steam, while the bottom remains comparatively cold. To do as I suggest, it will be said you will have to set the boiler up higher. I say no, for the work can be done with a smaller boiler and obtain the same heating surface, and thus economize in coal. I have been in care of steam boilers for the last thirty-seven years, and know something about the subject.

JOHN PETERS.

Haverstraw, N. Y., Sept. 8, 1883.

Liberian Sorghum.

To the Editor of the Scientific American:

Will you please allow me to add to the valuable information you have been giving on the subject of sorghum, the following items? The report of the United States Department of Agriculture shows that certain varieties of sorghum do not ripen in the latitude of Washington, D. C. At my request the Commissioner forwarded seed of one of these, the Liberian. Several patches were planted April 15; panicles were out in June, by July 1 some seeds were hard, by July 25 nearly all were quite hard.

One patch was planted June 10; panicles appeared in July, and some seed was hard by August 27. All is hard now, and the cane appears to be quite as sweet at the time of hardening of the seeds as the early planted canes were three weeks after hardening, the usual time of maximum sweetness; and further, this late planted, rapidly matured cane is much more juicy and tender than the ordinary crop, and it also has quite a different taste; it is pleasant, free from the usual gummy taste, and has none of the usual objectionable features of sorghum.

The first planted canes are also developing a feature that may be unusual.

Instead of suckering, shoots are sent out at the top joints, and when these shoots are about two feet in length, a cluster of roots forms at the base of the shoot, the connection with the old stalk constricts, and the young cane is so readily detached that probably it is dropped to shift for itself, so that this variety of sorghum, under favorable circumstances, appears to have two modes of reproduction—by the seed and by a detached rooted scion. These scions are produced in time for a second growth

By late planting it appears to be probable that the development of sucrose is begun much earlier in the growth of the plant than when planted in earth at a much lower temperature, a difference probably of 20° F. at time of germination.

The study of sorghums suited to southern climates may be productive of economic results quite as important as that of those suited to northern climates has already been.

JOS. VOYLE.

Gainesville, Fla., Sept., 1883.

The Storage of Wind Power.

To the Editor of the Scientific American:

I have been greatly interested in the several articles published in the late issues of your paper on the above subject, and therefore wish to give you some thoughts which have occurred to me that have not been touched.

A correspondent has suggested the raising of weights by wind power, and by means of clockwork obtaining the required motion.

This can be done, but considerable power would be lost in converting the slow motion of a falling weight into the quick speed of modern machinery.

I think a better way of storing power by the raising of weights is by means of an accumulator.

Considerable machinery is now operated by hydraulic pressure, and much more may be.

My plan would be to force the water into accumulators at a pressure of say 500 pounds per square inch, and then conduct this water in mains to the machines to be operated upon. There a three cylinder engine would be used if a slow motion is desired, or a water motor if a quick speed is wanted.

This method would do away with shafting, belts, pulleys, and their attendant dangers, besides being more fully under the control of the operator.

Of course the same amount of weight would have to be raised as by the clockwork system to store a given power, but I think the machinery could be made more compact; there would be less loss from friction, and it would require less care.

I see no reason why compressed air may not be used as a medium for the storage of wind power.

If the reservoirs are too bulky, make them stronger, and compress the air to higher pressure.

For use in air locomotives it is compressed to 600 pounds per square inch in this country, and Col. Beaumont compresses it as high as 1,000 pounds per square inch for use on his engine. Why may not as high a pressure as this be used on a stationary engine?

I think the cost of coiled steel springs would exclude them from being used for this purpose.

An amateur who wishes for a small power for a short period each day might, however, use them with advantage.

Another method which may be used in certain locations with advantage is the storage of water in reservoirs at a high level and using the turbine to get the required motion.

There are large marshes near the seashore which might be dammed and thus made into storage reservoirs at a small cost. In this case the tide might do its part in raising the water, and thus we could utilize the power of the moon as well as that of the sun.

Still another method would be to erect wind engines on high hills where the wind was strong and steady, and force compressed air in pipes to the factory. The reservoirs might in this case be located on the hill or at any convenient point where there was plenty of room. Water pressure might also be used in place of air if quite a large amount could be easily had.

But I think the best way to use the power of the wind is as a help to the user of water power in times of low water. Instead of putting in an engine let him erect one or more windmills, as circumstances require, and pump the water once used back into the mill-pond to be used over again.

In this way he may keep his ponds at nearly the same level, have a steadier power, and create no malaria by drawing down his ponds.

This method could be best used by those who have large ponds which cannot be drawn down appreciably in two or three days.

All these systems may be put into operation, perhaps a combination of two or more, each doing duty where best adapted, may prove the best in practice.

The question is, Will not the interest on the cost of so large a plant be greater than the cost of fuel to run an engine?

F. W. BLANCHARD.

Holbrook, Mass., September 3, 1883.

Improved Photo-Engraving Process by Capt. Bing.

1. Take some highly polished zinc, thickness No. 8 or No. 10; choose the smoothest sheets, free from streaks and defects.

2. Clean the plate in the water containing three per cent of hydrochloric acid, and get rid of all bubbles of hydrogen.

3. Render it hygroscopic in the bath of iodine, gallic acid, and phosphoric acid, indicated in the previous description of the process of photo-engraving in outline.

4. Next wash the zinc in running water, and dry carefully between blotting paper.

5. When quite dry, coat it with coal tar pitch, eight per cent dissolved in pure benzine; as soon as spread, it may be heated in the dark up to the temperature of 50° C., and allowed to dry until, upon cooling, it is no longer sticky.

6. Expose behind a positive plate having soft half tints.

7. Control the exposure with the help of slips coated with coal tar; it is more rapid than bitumen.

8. Develop as before with turpentine and benzine, and finish the process in petroleum and one-tenth its quantity of spirits of turpentine. This new bath by forming a light homogeneous varnish gives a chemical grain well suited to the half tints of the tar. Next cause the plate to rotate so that the mixture of petroleum and turpentine may be uniform in texture and almost entirely evaporated. Heat the plate again up to 50° or 60° C., and allow it to cool.

9. To engrave the image thus obtained on the zinc with all its half tints, make use of the following bath:

Pure water	100 grammes.
Water saturated with sulphate of copper	50 "
Sulphuric or hydrochloric acid	3 "

Bubbles of hydrogen will be disengaged from all the little points constituting the chemical grain of the plate, and at the same time particles of copper will be deposited in their place, forming a positive image, which must not be touched while in the bath. As soon as the image is well formed in copper, it can be removed and placed in water, frequently changed. It may next be wiped between blotting paper, and dried in the open air.

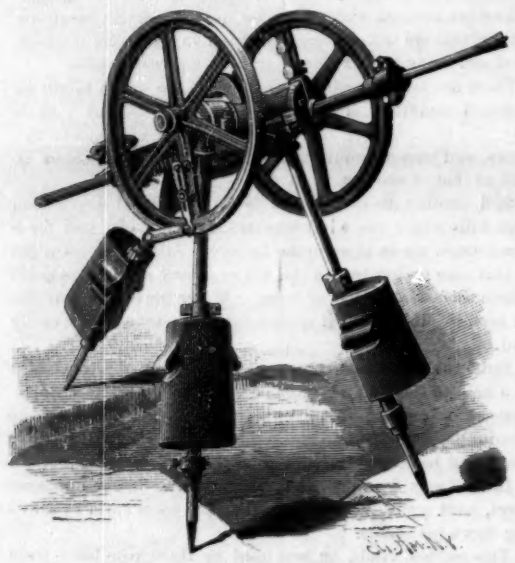
10. Remove the insoluble coal tar and non-adherent copper with a brush soaked in benzine. Rinse with clean benzine, and wipe well with a soft cloth so as not to scratch it.

11. To ink the plate, coat it with varnish or oil and fatty ink, so as to fill up the grain of the picture—heating it if necessary.

12. Rub the plate with a damp flannel to remove superfluous ink, and print off in a press for line engraving if the lines are deep, or in a lithographic press if but slightly indented. The depth of the lines in the plate depends on the thickness of the coal tar film. This process is most ingenious, and the various operations it admits of are more easy to execute than describe.—*Leon Vidal, in Photo. News.*

A Timber Worm.

A correspondent of the *N. W. Lumberman* says: It is not generally known, yet a fact, that extensive and valuable forests of yellow pine in the Southern States are destroyed by a worm, commonly called here at the South a "sawyer," or flat head. It is the opinion of a majority of the people in the South that the worm follows the death of the yellow pine, but close investigation has proved that although they never attack a forest or body of timber without first having a dead tree to start upon, they do not adhere to the rule after once getting a start. For instance, should a tree from any cause be felled or lodged against other timber, where the two are standing very close together, the worm will enter the adjacent timber though it be green and alive, and in this



HAND POWER ROCK DRILL

manner continue to spread till the entire forest is destroyed. Indeed, I have known instances where only a small sapling lodged against other timber caused considerable injury to the timber by souring, and thus attracting the parent worm or saw fly, and after accomplishing their work on the sapling they lose no time in removing their forces and attacking any of the timber that may be next closest; and in this way continue to spread until vast forests are denuded of their timber.

The parent fly, or rather bug, is one and a half inches long, and of an iron gray color. It has two feelers, or indicators, projecting from the head, from two to two and a half inches long, about the size of a very coarse horse hair. They are also provided with two teeth, operated by them similar to a pair of pincers, which are used in cutting through the pine bark to deposit their eggs. They attack the trunk of the tree first, and at any time during the summer season, but they seem to be more numerous and destructive during the months of June and July. The bug begins by eating numerous small holes through the bark, and very dexterously it deposits from four to six eggs in the edge of the sap, at the bottom of the hole thus made. From two to three days after the eggs are deposited in the sap, they hatch, and produce a worm one-fourth of an inch long, which immediately begins eating the sap, and steadily continues until the sap of the entire tree is consumed. A full grown worm is one and a half inches long, and is at any age a clear white color, excepting the head, which is dark red. They have no legs, but are seemingly jointed, and perfectly powerless to get about or travel, unless they are in their hole, where they utilize those joints to answer them the purpose of legs, and travel with astonishing rapidity.

As the worms become full grown, and the sap scarce, they enter the sappy portion of the timber, and cutting and forming a hole as they go of sufficient size to admit them, they thus wind about through it, and render it worthless, even before it has been damaged by decay. So prevalent and sure are they in the summer months, that the mill men of the South dare not keep a supply of logs longer than a few weeks in advance, unless they are provided with a boom or body of water of some sort to place them in, which is the only means of effectually preventing the logs from being eaten.

Vibration of Bridges.

At a recent meeting, in this city, of the American Society of Civil Engineers, a paper by James L. Randolph, member of the society, and Chief Engineer Baltimore and Ohio Railroad, upon "Vibration, or the Effect of Passing Trains on Iron Bridges, Masonry, and other Structures," was read. Mr. Randolph refers to the fact that double track bridges are moved in the direction of passing trains, and are consequently twisted, and strains are produced not provided for. Also that cattle-stops and open culverts, where built of rubble work, have the walls shaken to pieces by vibration.

The remedy he has supplied for these culverts and stops has been to build them of large stone as nearly the same size as possible The tall, thin bridge piers and abutments on which iron bridges rest have their stones so much disarranged by vibration as to make it necessary to secure them with timber and iron straps. Iron bridges resting on stone pedestals vibrate in this manner, and receive a return blow from the vibration of the pedestal, particularly if the pedestal is a light structure; but as the iron and the stone do not vibrate in the same period, there must be times when the result is a movement in the direction of the force. The effect of this vibration has been particularly noticeable at the Harper's Ferry bridge, where there was a movement of four inches in four years. After the insertion of planks between the stone and iron, this movement ceased. Where the masonry of piers has a platform of timber between its foundation and solid rock no displacement of stone has been noticed. Mr. Randolph contends that a monolith would be the best support for structures subject to vibration caused by strains, but that a monolith of the specific gravity of granite would give a damaging return blow. Timber would answer the purpose, but is perishable. The material which, in his opinion, is most serviceable is an artificial stone which is about two-thirds the weight of granite, is compact, durable, and with very little elasticity.

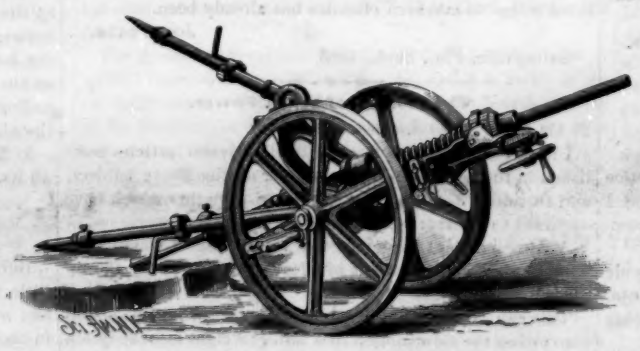
The English Skylark in America.

Two years ago eighty-four English skylarks were imported and loosed in Bergen County, New Jersey. This was in the spring, and it was ascertained afterward that about fifty of them paired and remained not far from where they first beat the free air of America with their wings. The lark is not a migratory bird, and it was feared that our northern winters would prove too severe for them, but during the next summer they were heard in Bergen and Passaic Counties. This, the third summer of their liberty, shows yet stronger proofs of their naturalization and ability to breed here. They have been heard in more places.

The New York *Sun* says that "one thing said to be much in favor of the increase of the lark in this country is its hardiness. It can endure cold and heat. It takes a long range of distribution, from the south of Europe as far north as Norway and Lapland, and American ornithologists lay claim to it as an American bird, from its being occasionally found in Greenland and in the Bermudas. Vigilance, it is thought, may be required to protect them from enemies, and to discover what are their worst enemies. From the fact that skylarks increase most rapidly in highly cultivated grounds, it is inferred that man is not his worst enemy, although large numbers are destroyed by man. As it sleeps and nests on the earth, it is thought probable that its worst enemies are small animals, such as minks, weasels, and skunks."

NEW HAND POWER ROCK DRILL.

This machine is designed to be run by two men, and it is so simple in its construction that any one, by a few minutes' observation, may fully understand how to operate it. The drill is self-contained, and can be moved as may be wanted from the tripod to a column, in a few minutes. It swings from a central bearing into any desired position. By revolving the balance wheels, the double cams come under a tappet on the drill bar, raising it five inches, twice every revolution of the wheels, at the same time compressing the spring to a pressure of about 400 lb., the pressure being variable at pleasure. The drill is rotated to round the hole as it moves back and forth, by ingenious and simple mechanism. The forward motion of the drill is regulated by an automatic feed-screw as the rock is cut away, the advance of the bar being more or less rapid, as, by the variation in the nature of the rock, the cutting is fast or slow. When the drill bar has been fed forward the entire length of the feed-screw, it may be easily run back and a longer drill attached. The feed-screw feeds 18 inches before changing drill points. The rotation of the drill can be varied, so as



HAND POWER ROCK DRILL.

to cut 12ths or 16ths, according to the nature of the rock, and the regular rotation of the drill insures the delivery of each blow, so that each wing of the drill point strikes the rock just far enough in advance of the cut of the preceding blow to chip away the rock lying between.

As the chip yields, the drill point is allowed to react, saving the wings and edge of the drill point; and the cut from one blow is forced out of the hole when the drill descends for the next, thereby cutting the rock clean at each blow. By this arrangement the drill point may be advanced very much farther in the rock, without sharpening, than in hand drilling.

For quarrying, or any surface work, the drill is mounted on a tripod, having all the adjustibility required to adapt it to uneven surfaces, and it may be swung to any required angle.

For cutting marble, slate, or granite, it is often desirable to avoid blasting, and the consequent breaking of the rock. For this purpose this machine is invaluable, as holes from one to two inches in diameter can be drilled in a row two inches apart, then the connection between them broken out by simply taking off the rotating ratchet, and attaching a flat bar of steel in place of the drill point.

With these drills holes can be drilled from three-fourths of an inch to six inches in diameter, and to any depth. We are informed that in granite, one and one-fourth inch holes can be drilled at the rate of from one and a half to two and a half inches per minute.

HAND POWER ROCK DRILL.

The Biddeford *Journal*, of June 22, says: Twelve men, including Mayor Staples and Street Commissioner Strout, stood for an hour in the drizzling rain at Bragdon's granite quarry, Wednesday forenoon, watching the Champion Rock Drill bore its way through a ledge of solid granite. The drill is constructed of malleable iron and steel, stands about five feet high on three supporting iron legs, and is propelled by hand power. The principle is the same as that of a steam drill, cam and spiral spring, is simply constructed, and easily understood. There are three sets of springs, the lightest storing about 275 pounds of power, and the heaviest 475 pounds. By compressing these springs, however, 100 pounds additional power is obtained.

The exhibition was in every way a success, the drill doing all that was claimed for it.

The New England Rock Drill Company, Auburn, Me., are the manufacturers of this drill.

Wire Railway.

The following description has been given of a wire railway in connection with the coal mining industry established near the Hersteigg, the products of which it brings to the main line belonging to the Southern Railway of Austria. In its alternating rise and fall during its distance of 3,000 yards there is a useful excess of incline of about 142 yards, which, it is said, suffices to keep the line in self-acting working, after it has been started by means of the twelve horse power engine provided for that purpose. When there is no return load to be sent to the mine, the speed of the train can be regulated by a brake. Under these circumstances the cost of working the line is estimated at about 5½ cents per ton of coal. In its general arrangement the railway forms a straight line, and consists of two drawing ropes and the train rope. The line which is used for conveying the coal to the station is 1·10 inches thick, and is composed of nineteen steel wires, each 0·18 inch in diameter. The line on which the coal vessels are returned to the mine is only 0·66 inch thick, the nineteen steel wires of which it is composed being only 0·13 inch thick.

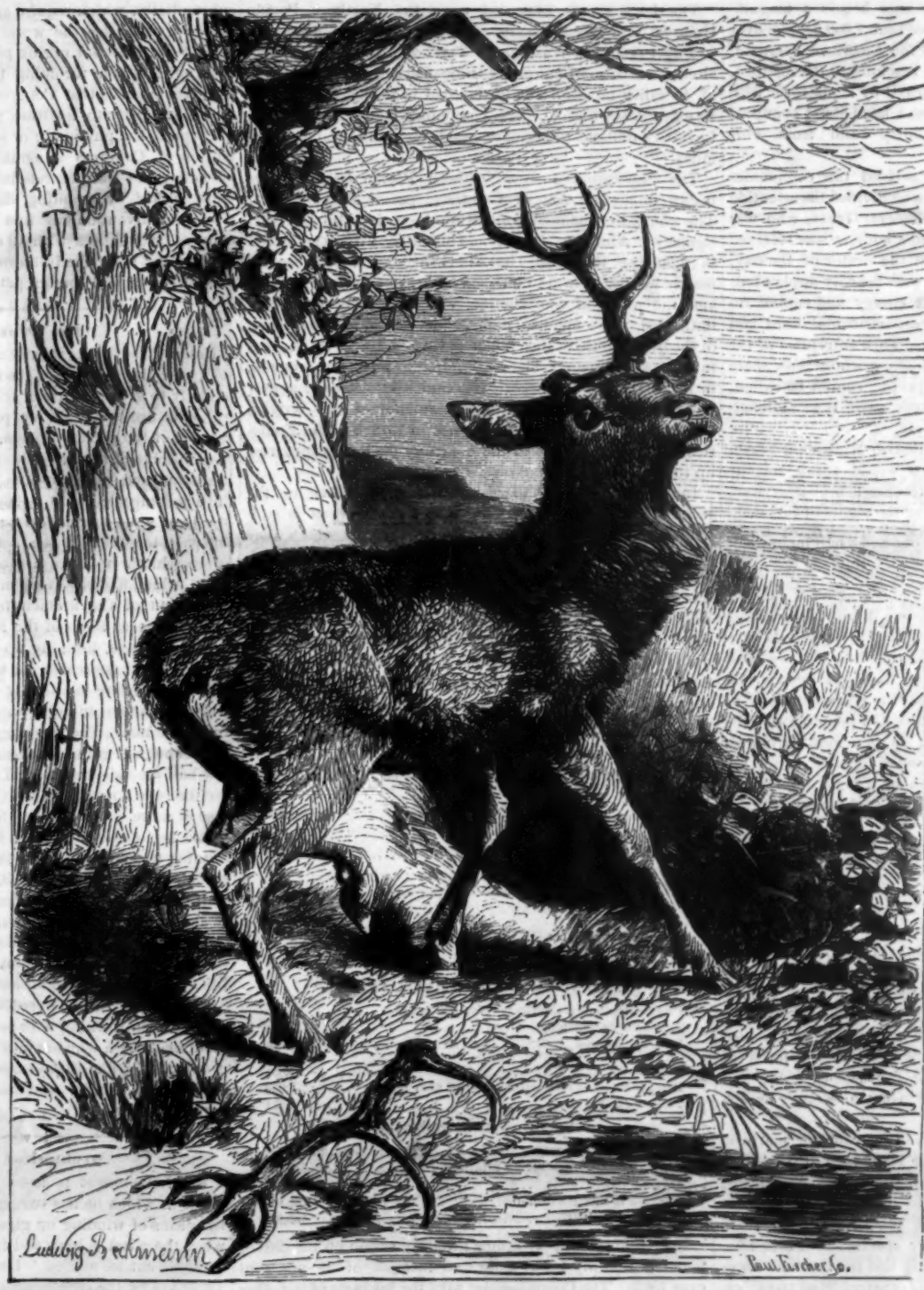
Both ropes consist of wires about 765 yards long, coupled to each other, and for the ropes a breaking strength of 73 tons per square inch section is guaranteed. At the ends of the ropes weights of five tons and three tons are applied in the usual way for obtaining the proper tension. The distance between the seventeen supports varies from 60 to 400 yards. The train rope is 0·6 inch thick, and consists of twelve soft steel wires of 0·07 inch in diameter, and runs at a speed of about 1⅔ yards per second. The vessels which convey the coal follow each at a distance of about 83 yards. Thus thirty-six are always on the way to and the same number coming from the station. Each vessel contains about ten bushels or about a quarter of a ton of brown coal, the total quantity carried per hour being about 17½ tons. The cost of the line was about £5,000.—*Engineer*.

THE fig is said to be a sure crop in most of the Southern States. The cost of cultivation is trifling.

METAMORPHOSIS OF THE DEER'S ANTLERS.

Every year in March the deer loses its antlers, and fresh ones immediately begin to grow, which exceed in size those that have just been lost. Few persons probably have been able to watch and observe the habits of the animal after it has lost its antlers. It will, therefore, be of interest to examine the accompanying drawing, by Mr. L. Beckmann, showing a deer while shedding its antlers. In the illustration the animal has just lost one of its antlers, and fright and pain cause it to throw its head upward and become disturbed and uneasy. The remaining antler draws down one side of the head and is very inconvenient for the animal. The remaining antler becomes soon detached from its base, and the deer turns—as if ashamed of having lost its ornament and weapon—lowers its head, and sorrowfully moves to the adjoining thicket, where it hides. A friend once observed a deer losing its antlers, but the circumstances were somewhat different. The animal was jumping over a ditch, and as soon as it touched the further bank it jumped high in the air, arched its back, bent its head to one side in the manner of an animal that has been wounded, and then sadly approached the nearest thicket, in the same manner as the artist has represented in the accompanying picture. Both antlers dropped off and fell into the ditch. Strong antlers are generally found together, but weak ones are lost at intervals of two or three days.

A few days after this loss the stumps upon which the antlers rested are covered with a skin, which grows upward very rapidly, and under which the fresh antlers are formed, so that by the end of July the bucks have new and strong antlers, from which they remove the fine hairy covering by rubbing them against young trees. It is peculiar that the huntsman, who knows everything in regard to deer, and has seventy-two signs by which he can tell whether a male or female deer passes through the woods, does not know at what age the deer gets its first antlers and how the antlers indicate the age of the animal. Prof. Altum, in Eberswalde, has given some valuable information in regard to the relation between the age of the deer and the forms of their antlers, but in some respects he has not expressed himself very clearly, and I think that my observations given in addition to his may be of importance. When the animal is a year old—that is, in June—the burrs of the antlers begin to form, and in July the animal has two protuberances of the size of walnuts, from which the first branches of the antlers rise; these branches having the length of a finger only, or being even shorter, as shown at 1 in diagram. After the second year more branches are formed, which are considerably longer and much rougher at the lower ends than the first. The third pair of antlers is different from its predecessors, inasmuch as it has "roses," that is, annular ridges around the bases of the horn, which latter are now bent in the shape of a crescent. Either the antler has a single branch (Fig. 3, *a*), or besides the point it has another short end, which is a most rare shape, and is known as a "fork" (Fig. 3, *b*), or it has two forks (Fig. 3, *c*). In the following year the antlers take the form shown in Fig. 4, and then follows the antler shown in Fig. 5, *a*, which generally has "forks" in place of points, and is known as forked antler in contradistinction to the point antler shown in Fig. 5, *b*, which retains the shape of the antler, Fig. 4, but has additional or intermediate prongs or branches. The huntsmen designate the antlers by the number of ends or points on the two antlers. For instance, Fig. 4 is a six ender; Fig. 5 shows an eight ender, etc.; and antlers have been known to have as many as twenty-two ends. If the two antlers do not have the same number of ends, the number of ends on the larger antler is multiplied by two and the word "odd" is placed before the word designating the number of ends. For instance, if one antler has three ends and the other four, the antler would be termed an "odd" eight ender. The sixth antler shown in Fig. 6 is a ten ender, and appears in two different forms, either with a fork at the upper end, as shown in Fig. 6, *a*, or with a crown, as shown in Fig. 6, *b*. In Fig. 7 an antler is shown which the animal carries from its seventh year until the month of March of its eighth year. From that time on the crowns only increase and change. The increase in the number of points is not always as regular as I have described it, for in years when food is scarce and poor the antlers are weak and small, and when food is plentiful and rich the antlers grow exceedingly large, and sometimes skip an entire year's growth.—*Karl Brandt, in Leipziger Illustrirte Zeitung.*



METAMORPHOSIS OF DEER'S ANTLERS.

Bourseul's Claims to the Invention of the Telephone.

A correspondent sends us the following interesting communication: "After the able manner in which Professor S. P. Thompson has put forward the claims of Reis as the first and true inventor of the telephone, as opposed to those of Bell, it is rather surprising to suddenly come across a publication to the effect that the labors of both these men have been anticipated by one Charles Bourseul, in 1854. The publication in question is a lecture delivered by Captain Holthof, in April, 1881, to the Electrical Society of Frankfort, and will be found on page 48 of that society's *Journal*, which, for some reason unknown, has only just appeared.

"The following passage, quoted from the lecture, will be read with interest: 'If we agree to call the true inventor that man who is the first to conceive clearly a new idea, and who tells us how this idea can be carried out in practice, then the telephone was invented in 1854 by Charles Bourseul, a Frenchman, and about that time a soldier in the African army.' We learn further from the same source that the invention had been communicated in 1854 to the French Academy, and that more or less detailed descriptions of it went the round of the German papers of that period. Notable in this regard is one article which appeared on the 28th September, 1854, in the *Didaskalia*, a supplementary paper to the *Frankfurter Journal*, which sets forth the very gist of the invention so clearly that, in spite of its ancient date, a short abstract from this paper may be interesting to our readers:

"An electric current passing through a wire transforms a piece of soft iron into a magnet. If the current ceases, the magnetism also ceases. This electromagnet can be made to alternately attract and release a movable plate, which in its to-and-fro movements produces the conventional telegraphic signals. Now, it is also known that all sounds which reach our ear are produced by vibrations in the air, and that the infinite variety of sounds depends solely on the speed and magnitude of these sound waves. If, now, a metal disk could be invented which would be flexible enough to reproduce all the sound waves transmitted to it by the air, and if that disk could be connected to an electric circuit—in such a way that in conformity with the vibration of the air it would start and interrupt the current—then it would also be possible to cause a similarly constructed metal disk, in electrical connection with the first, to repeat all the movements of it, and the effect would be the same as if one had spoken directly against this second disk—that is to say, the ear would be affected in the same manner as if it heard the speech directly through the first metal diaphragm.'

"Captain Holthof considers it very astonishing that Reis did not know of Bourseul's invention, but infers this to be the case, as otherwise he would have introduced at once the second diaphragm. As regards Bell, the lecturer thinks it 'downright incredible' that Bourseul's labors should not have been known to him. In conclusion, Holthof suggests that Bourseul should be recognized as the father of the telephone." We may add that the claims of Bourseul in this direction have had a most notable advocate in M. le Comte du Moncel, the well known and prolific writer on electrical subjects.—*The Electrician.*

A SYNDICATE in Galveston proposes to build wharves out to deep water in the Gulf of Mexico. To do this they will try to borrow $5,000,000 of the State's surplus, which will exceed $5,000,000 two years hence, and will be $10,000,000 within five years if the State sells the school lands.

A PARTY of Italian scientists have just returned from an expedition to the South Pacific, having proved to their own satisfaction that a race of giants once existed in Patagonia. In wandering over Terra del Fuego they found human bones of marvelously large size.

COMPLETION OF THE GREAT NORTHERN PACIFIC RAILROAD.

Among the most remarkable of recent events in this wonderful country is the "Driving of the Last Spike" for the completion of the Northern Pacific Railway, and the opening of this great thoroughfare to public travel, from St. Paul, Minn., to Portland, Oregon, a continuous distance of about 2,000 miles. The construction of the finishing sections of the road has been prosecuted during the last two years with extraordinary vigor, under the able management of Mr. Henry Villard, the President. The putting in of the rails for the last one thousand feet of the track and the driving of the last spike made occasion for a novel kind of railway celebration, in which many prominent personages from the Atlantic and Pacific shores and from the continent of Europe took part. The locality of this celebration was in Montana, fifty-five miles west of Helena, between Garrison and Gold Creek. Here, on the 8th of September last, according to the particulars given by a correspondent of the New York *Tribune*, came thundering along at the appointed hour, from two different directions, many long trains of cars, bearing prominent citizens from the Pacific coast to participate in the ceremonies. There were hearty greetings between the American guests of the East and West. All were surprised at what they beheld. Instead of the wilderness of the Rocky Mountains, they here beheld a magnificent pavilion capable of seating more than 1,000 people, over which floated the national colors of the American, German, and British nations. In front, and reaching to the roadbed, was an extensive promenade skirted by a platform with comfortable seats. To the right was a band-stand occupied by the Fifth United States Infantry band from Fort Keogh.

As soon as the last of the guests arrived the ceremonies were opened by President Villard, who divided the attention of the enthusiastic multitude with General Grant, who was seated on the platform. Mr. Villard's address was received with applause. He then introduced the orator of the day, ex-Secretary Evarts. His address was heartily applauded. Secretary Teller spoke on the great energy and capital required to complete the various transcontinental lines and their practical benefit to the nation. This enterprise of the Northern Pacific Company, he said, along whose lines there will be in a few years 9,000,000 of people, cannot be called, he said, local in its character. It was more than national; it concerns the welfare of other people.

Hon. Lionel Sackville West, the British Minister at Washington, said that Sir James Hannen would speak for the English guests. Sir James said the English visitors were filled with wonder and admiration by the sights of this magnificent country and its institutions. Mr. Villard was a person about whom their warmest sympathies and gratitude for this splendid hospitality could well cluster. "We have had the happiness," he continued, "of seeing what manner of man he is. We have been able to see in him the qualities which have earned for him the confidence of those who have been associated with him throughout his life, and we shall now carry back the recollection of having known a real man. It was a happy thought that the representatives of the countries which have contributed the population to the American nation should be present on this most extraordinary occasion. It fills me with wonder and awe to see the prosperity which has advanced with such rapid strides and which has at once reached the highest development of civilization."

The German Minister, Herr von Eisendecher, was then presented. He expressed the hearty good wishes of his fellow countrymen for the enterprise.

The Governors of Wisconsin, Minnesota, Dakota, Montana, Oregon, and Washington were also introduced, and made brief and appropriate remarks. General Grant, as he came forward, was received with hearty cheers. He greatly pleased the audience, which was largely made up of veteran soldiers, when he said that these intercolonial railroads would have amounted to but little were it not for the men who, after the war, had sought the Territories as fields of enterprise. They had made these railroads possible and prosperous. At the conclusion of General Grant's speech three rousing cheers were given.

The foreign guests were then given seats on the platform by the railroad, when a photograph was taken of them, Mr. Villard and family, and the most distinguished Americans. After that a horse that helped to build the road from its inception was brought upon the platform. Then there was witnessed a most extraordinary spectacle. Three hundred men with brawny arms quickly laid the iron and drove the spikes on the thousand feet of uncompleted track, except the last spike.

During the progress of the work, which was witnessed by the foreigners with amazement, the band played and the people cheered. When the work was nearly completed, a cannon salute was fired by the detachment of the 5th Infantry present. The last spike was finally driven home by H. C. Davis, assistant general passenger agent of the road, who drove the first spike on the opening of the road, and this spike was the same one first driven by him. The end was reached as the sun was setting behind the mountains. The enthusiasm of the audience, variously estimated at from 2,000 to 5,000, was indescribable. The heights reverberated to the mingled sounds of Cave Cameron and the shouts of men. When the ceremonies were over the trains were reformed and the guests departed, the English and part of the Americans, including George M. Pullman and Vice-President Harris, to the East, the rest westward to Puget Sound. The easterly end of the Northern Pacific Railroad is forked, one fork beginning at St. Paul, Minn., where connection is made with the general railway system of the United States; the other fork begins at Duluth, at the extreme westerly end of Lake Superior, which opens to the Northern Pacific Road more than two thousand miles of lake and river navigation. The two forks of the road unite at Brainard, Minn., which is near the center of the State, in about latitude 46. Thence the road extends due west, through Minnesota and the northern part of the Territory of Dakota, into Montana, until it reaches the Yellowstone River. The Missouri River is crossed at Bismarck, Dakota, on a splendid iron bridge, costing over one million dollars. In Montana the road follows the valley of the Yellowstone in a south westerly direction to Livingston, where there is a short branch road to the great National Park. From this point the road turns northwesterly to Helena, and on through the mountains and mining regions into the northern corner of Idaho, to the famous late Pend d'Oreille, into Washington Territory, thence southwesterly to Wallula Junction, thence northwesterly over the Cascade Mountains to Tacoma, where it connects with the navigation of Puget Sound and the Pacific Ocean; thence southerly to Portland, Oregon, and its railway, river, and ocean communications.

The land grants bestowed upon the Northern Pacific Railroad are extraordinary. They extend from Minnesota to Puget Sound in Washington Territory; they cover every alternate section of one square mile (640 acres) for a distance of 40 miles on each side of the road in the Territories, and 20 miles in the States. The company's lands embrace some forty-two millions of acres, or nearly eighty thousand square miles.

The explorations for the Northern Pacific Railway were begun under an Act of Congress, passed March 3, 1853. The company was incorporated by the Act of July 2, 1864, signed by Abraham Lincoln. Difficulty was experienced in financing the road; but, in 1870, Jay Cooke became deeply interested in it; he raised large amounts of money, and the work of construction was vigorously prosecuted until 1873, when financial depressions caused the suspension of the great house of Jay Cooke & Co., and with it the great railway went down. The road fell into a receiver's hands; in 1874 foreclosure of mortgages and sale resulted; a new organization followed under the presidency of Mr. Wright, of Philadelphia. He was succeeded in 1878 by Mr. Frederick Billings, under whom the company made good progress up to 1881.

In this year Henry Villard, of Oregon, appeared on the scene. This extraordinary man told his various friends that he had a scheme for making money in which they might join, provided they would put up ten millions of dollars in a "blind pool"—that is, without knowing what it was for. This they did, and with the money in hand Mr. Villard gained the control and presidency of the great railway, and finished up the work with astonishing rapidity. Such in brief is the history of the third and last great American railway across the continent.

THE PATENT OFFICE REPORT FOR 1883.

The Commissioner of Patents has submitted his report for the fiscal year ended June 30, 1883. It shows the following facts:

APPLICATIONS.

For patents	32,845
For design patents	1,039
For reissue patents	247
For registration of trade marks	854
For registration of labels	749
Total	35,734
Total in 1882	30,002
Caveats filed	2,686

PATENTS AND TRADE MARKS ISSUED.

Patents granted, including reissues and designs	21,185
Trade marks registered	883
Labels registered	618
Total	22,686
Patents withheld for non-payment of final fees	2,056
Patents expired	7,471

RECEIPTS AND EXPENSES.

Receipts from all sources	$1,095,884
Expenditures (not including printing)	677,628
Surplus	518,235
Increase in receipts over 1881	305,989
Increase over 1882	165,020

The number of applications awaiting action on the part of the office on July 1 was 4,699, an increase of 39 per cent over 1882. The Commissioner says the business of the office is steadily and rapidly increasing in each of the divisions of the office. The success of the patent system, the Commissioner says, is due largely to its liberality to inventors, and the security and protection it affords them. It was not intended that revenue to the Government should be obtained by charges made for vesting in the inventor the right and title for a limited time to the exclusive use of his invention. But not only have the fees received on applications filed been sufficient to pay all the expenses of the office, but a large surplus—nearly $2,500,000—now stands to the credit of the office in the Treasury. Greater liberality might, perhaps, be extended to the inventor by reducing the fee to be paid before a patent can issue, and with beneficial results. Certainly a more equitable rate of fees could be adopted than is now provided by graduating the fee to the character and nature of the invention. The fees now required in some cases are excessive, and in others exceedingly small. In this way, rather than by an indiscriminate reduction in the fees now charged, as is urged by some, justice would be secured, and the office still be self-supporting.

Commissioner Marble comments with some severity upon the action of Congress in refusing the additional clerical force required, and in reducing the number of overworked employes. He says: "I have learned with great satisfaction that inventors and manufacturers throughout the country will soon take steps to impress upon those who have hitherto treated their rights with some indifference the importance of having a sufficient force in this bureau—as well as other appliances and accommodations—to fairly and promptly act upon their applications and determine their rights to the inventions claimed by them. It is believed by most of them that their votes are of quite as much importance and their support to the Government fully as necessary as pensioners and settlers upon the public lands, to whom not too great liberality has been shown."

Attention is called to the fact that a large number of examiners and assistant examiners have resigned during the last year. The Commissioner assigns as the principal reason for the resignations the insufficiency of the salaries allowed, and says the office feels the loss of such experienced men more than any other bureau. He adds: "The same reasons, substantially, which require an increase in the force of the offices in order that the work may be promptly and efficiently done, exist for urging proper salaries for securing the most efficient men for doing this class of work." The report recommends that Congress confer upon the Commissioner authority to institute proceedings to determine the question of the public use or sale of an invention. The attention of Congress is again called to the necessity for amending the statutes relating to the issue of foreign patents, either by granting the patent for a definite term, where the invention has first been patented in a foreign country or countries without any conditions subsequent, or by granting it for the full term of seventeen years from the date of the earliest foreign patent.

Too Much Haste.

Unlike New York, the fire alarm wires of Boston are used solely for the business of the department, and are therefore unlikely to get out of order. The several houses and central office are connected by private telephone. In general support of the present system, the commissioners say they can conceive of nothing better. While there is sometimes inconvenience caused by the turning out of all the men in the department at every alarm, whether the engines leave the houses or not, the commissioners say that, if it were not for this rule, the men in the outlying districts would hardly have to hitch up once a month. A growing evil in New York, which has been very much curtailed in Boston, is the calling out of the firemen for exhibition purposes. Says Chief Engineer Bates of the New York department: "This second business, hitching up in so many seconds and half seconds, is all nonsense. It makes the men reckless. They have need of care in hitching up and turning out, for there is always danger, in going to a fire, of being upset, smashed, and what not. The company would always get there in time enough if going with due regard to safety, even if a few half seconds were lost. Then, again, after the race to the fire, there is a rivalry to get the hose run out first. Now, in case of a fire on an upper floor of a tall building, there would be a chance to make time by all turning in to help running up the hose. But instead of that, the companies are apt to be running opposition as to who shall get up first, and by a scattering of strength they lose ground instead of gaining it. Then, when they do get the water on, the chances are, in their zeal, they throw too much on to have the name of having put out the fire. All that is wrong. Like the rushing down all hands at the first tap of the bell, it is overdoing it, and overdoing a thing is as bad as undoing it. Men working with sense and reason can do a heap more than those who are in a hurry and stew, where there is no need." The Boston board of engineers cordially indorse this statement, and endeavor to act accordingly.—*Firemen's Standard.*

Mechanical Speculations.

A correspondent incloses a published slip from a newspaper in which he has suggested the storage of wind power by means of winding up gigantic springs like watch springs when the wind is high and free, the power thus obtained to be given out as needed. He suggests the heating of our dwellings by the compressing of air, and the cooling of them by expanding the air. He considers electric light and the mechanical power for any necessary handy purposes as being also products of this harnessed wind force. But he goes still further and suggests the millennium of laziness. He says:

"Our food and clothing are now produced by very tedious, inconvenient, laborious, circumlocuted, and expensive means. The raw materials, from which they are produced, are dirt, water, and air. The inter-chemical action of these materials, aided by the effect of heat and light, managed by a vast amount of mechanical force, is the *modus operandi* of production. But heat and light being interchangeable with mechanical force, why is it not possible to produce food and clothing, in finished form, directly out of dirt, water, and air, by mechanical force?" This unanswerable question appears to cut off debate and close the subject.

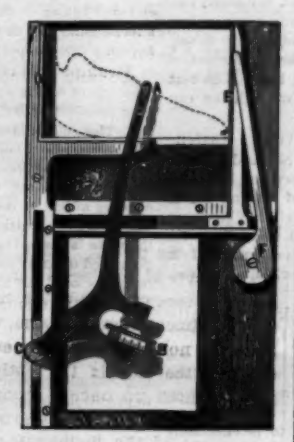
RECENT INVENTIONS.

Egg Tester.

The box is provided with a perforated tray for receiving the eggs to be tested. A lamp, inclosed by a reflector and opaque chimney, is located at the end of the box, and the concave cover of the box acts as a reflector, throwing the light down upon the eggs. A mirror in the bottom of the box is placed at the proper angle to reflect the image of the eggs through the oblong slot in the top of the box at the front. This device enables a person to inspect the entire tray at a single glance, and it permits of testing the eggs as rapidly as the trays can be removed and replaced. Mr. Thomas H. B. Sanders, of St. Louis, Mo., is the patentee of this invention.

Instrument for Averaging the Breadth of Irregular Planes.

This instrument is especially designed for measuring the mean height of indicator diagrams taken on steam engines, but it has other applications. The table, which is of well seasoned wood, is faced with soft paper of uniform quality, adapted to receive the impression of the sharply cut edge of the graduated wheel carried by the bent bar. Metallic clamps, serving also as rulers, hold the diagram in position to be traced by the scribing point on the bar. The larger end of the bent bar is pivoted to a block sliding in a groove near the edge of the board. One of the rulers is provided with a T-head, which is received and guided by a transverse groove in the table. This ruler is retained in whatever position it may be placed by a flat spring pivoted to the table. To take the average height of a diagram the wheel is first turned to the zero mark, then the tracing point carried by the bent bar is moved so as to exactly follow the line of the diagram, beginning at the movable ruler and ending in the same place. The distance the wheel has turned is now noted, and the tracing point is moved upward along the edge of the movable ruler until the wheel is returned to its original position. The tracing point is then pressed into the paper and the length of the straight line thus traced will represent the average height of the diagram. This instrument is the invention of Mr. John Coffin, of Syracuse, N. Y.



The Air-Space Wire-Gauze Insole.

The proper protection of the feet is a subject all are interested in on account of its influence over the general health and comfort of the wearer. We illustrate here a novel arrangement for this purpose which possesses some peculiar advantages. If we lay together two pieces of wire gauze (tinned iron is used) so that the wires cross each other diagonally, and place them between two cards, the cards are held firmly apart while the intervening space is found to be nearly all air—about 90 per cent by mathematical calculation. A loose insole is formed of two layers of wire gauze, about No. 20. These are covered on the upper side with a layer of canvas or leather, which is turned over the wire gauze at the edges and stitched through. This being placed in the shoe positively prevents the stocking from coming into contact with a wet shoe sole, and thus completely protects the foot by a medium which neither confines the perspiration, like cork or gum, nor absorbs and retains it, like felt. The stratum of air, being a non-conductor of heat, also tends to preserve the natural temperature of the foot, and by the motion of walking admits of ventilation. Two patents have recently been issued on this invention—one for the loose insole, the other for inserting the wire gauze in the shoe sole during manufacture, the principle being the same in both. The cuts clearly illustrate each, and for further information address J. Jenkins, Germantown, Philadelphia, Pa.

A Novel Fireless Locomotive.

Mr. Moritz Honigmann, of Grevenberg, has invented a traction engine, especially intended for use in streets, mines, and tunnels, or wherever the absence of noise, smoke, and disagreeable gases is desirable. The salient feature of his invention, says *Engineering*, is the use of caustic soda to absorb the exhaust steam, and to liberate a part of its latent heat to be employed in the production of additional steam to drive the engine. If exhaust steam at a temperature of 212 degrees be injected into a solution of caustic soda, of a specific gravity of 1·7, the temperature of the mixture will rise to about 374 degrees, while the vapor tension will not exceed one atmosphere. Supposing the hot solution to replace the fire in a boiler, it is evident that a part of its heat will travel through the plates to the water, if the temperature of the latter be lower than that of the solution, and will evaporate a portion of it, and that this action will continue as long as the soda maintains its power of absorbing the exhaust steam without giving rise to any great back pressure. Mr. Honigmann's engine is at work as a tramway locomotive, and will run continuously for five hours with a charge of 500 kilos of caustic soda of 1·7 specific gravity. The following description of its mode of action is taken from our contemporary, *L'Ingenieur Conseil*. Mr. Honigmann's motor has a small boiler, but no chimney. The boiler is a cylindrical reservoir of water heated to a temperature corresponding to the pressure desired, and surrounded with another reservoir filled with caustic soda, either in a state of solidity, or of highly concentrated solution.

Now, it is well known that caustic soda is a substance having a great affinity for water, with which it forms a hydrate. In the formation of this chemical combination a considerable quantity of heat is liberated, and Mr. Honigmann has drawn up tables of the boiling points and corresponding effective pressures of different strengths of the solution of caustic soda, from which it appears that a solution of 60 parts of water to 100 parts of soda can absorb vapor at a tension of 7·1 atmospheres, given off by water at a temperature of 167 degrees Cent. (332·6 degrees Fahr.), without in its turn giving off vapor having a greater tension than one atmosphere. It is therefore possible to absorb, by means of caustic soda, considerable quantities of exhaust steam, without creating behind the piston a counter pressure exceeding one atmosphere. Suppose, therefore, that the supply pipe of the steam cylinders communicates with the reservoir of water heated, for instance, to 166 degrees Cent. (330 8 degrees Fahr.), and therefore at a tension of 7 atmospheres, and that the exhaust pipe passes into the reservoir of caustic soda, itself heated by the vicinity of the water to a temperature of about 140 degrees Cent. (284 degrees Fahr.), it will follow that as soon as the valve is opened the pressure will diminish in the reservoir which contains water and steam, the water will give off a certain quantity of steam, which, after it has done work in the cylinders, will pass into the reservoir of caustic soda; the steam will heat the solution and be absorbed by it, a certain amount of heat being liberated in the process, which will raise the temperature of the solution, and the general result will be that the temperature of the solution will rise, and that of the water fall.

The difference becomes constant as soon as the amount of heat returned by the solution to the water, through the partition that separates them, becomes exactly equal to that converted into work in the cylinders. Mr. Honigmann had two thermometers placed upon his trial engines, on which these variations of temperature could be exactly followed. Suppose, again, that the work done in the cylinders is 300 kilogrammeters (2,160 foot pounds) per second, which corresponds to 4 horse power, there will be, according to the mechanical theory of heat, an absorption of

$$\frac{300}{424} = 0{\cdot}7 \text{ calorie per second.}$$

The steam, therefore, which issues from the boiler, parts with 0·7 calorie of its heat in the cylinders, and carries the rest into the solution, and in chemically uniting with the latter, it develops additional heat. Now if the latter quantity be equal to the 0·7 calorie lost, and if the difference of temperature between the water and the solution be such as to permit it to pass through the partition, the temperature of the water will be kept up, and the pressure maintained. This is exactly what takes place if the dimensions of the two reservoirs and the quantities of water and of solution have been suitably proportioned. The full work is obtained from the engine, and all the heat which is not transformed into energy is stored up in the caustic soda, while the water is vaporized without any notable variation in the pressure. An observer placed upon the engine will notice that when the locomotive first starts, the pressure falls rapidly for about one atmosphere, and then remains fixed; but if the engine is stopped, it falls a little, and rises again as soon as work is resumed. In order to put the engine in working order again after the caustic soda has ceased to be sufficiently concentrated, all that is necessary is to refill its reservoirs with water and soda solution under the original conditions. The moisture absorbed by the caustic soda can be driven off again by evaporation, and the solution thus restored to the necessary degree of concentration. This is done in the central station, where the engines receive their supplies, at an expenditure of 1 lb. coal for every 10 lb. of water evaporated. Compared with other fireless engines, Mr. Honigmann's is exceedingly economical. The author of the article from which we quote estimates that in order to do the same work, an engine on the best system now in use would weigh 10 tons 16 cwt., where one of Mr. Honigmann's would weigh only 4 tons 18 cwt.

Reducing Fat by Exercise.

As a general rule it may be said that the most effective exercises for reducing weight are those which act most effectively on the respiratory organs. Running, for instance, is far more quickly effective in this way than walking, though quick walking is a very excellent exercise for the purpose. A steady run taken every morning before breakfast, and another taken every evening shortly before retiring to rest, will be found to produce a marked effect on undue, deposits of adipose tissue. But here a word of caution should be repeated. To any one who is thoroughly out of condition, especially if he has long been so, running is rather a dangerous exercise. To run a couple of hundred yards at a moderate rate might do serious injury to a man well advanced in middle age who has long been fat and unwieldy. But even a man of forty not very much out of condition, who has for several years taken little active exercise, ought to be careful how he starts to run more than a few hundred yards, except at a very moderate pace. The best plan is to begin for a week or two with about two hundred yards (unless very heavy) run steadily, but each day a little more sharply. By the time that distance is run at a good sharp pace, the second wind will come easily. Then the distance can be safely increased, until after a while the morning and evening run is from half a mile to a mile in length. It is well to walk out whatever distance one proposes to run (pacing 200 hundred yards for instance at about a yard a pace) and to run home, going then to bedroom or dressing room to make any necessary changes of dress and to rub down. Although no man should consider himself in decently good condition if he cannot run half a mile at a moderate pace without being obliged to change his inside clothing (on account of the freedom with which he has perspired), yet a fat reducing man is not likely to get through his morning or evening runs without freely perspiring over his work. He should never suffer his wet flannels to remain on him to dry.

Riding and rowing are both good exercises for reducing fat, and tricycling is even better. Boxing, fencing, and single stick are also excellent. Bowling and quoits are good, and skittles first rate. Paterfamilias will find bowling for an hour or two to his boys at their cricket practice, very good exercise for reducing fat, and very pleasant if he chances to have any bowling skill. If he has not, then it would be perhaps rather wearisome. Capital exercise can be obtained by removing from a good sized room all easily breakable objects, and then playing with a light elastic ball, thrown in such a way against the wall that some activity is necessary to take it, either by catching or with stroke of hand or racket. In an open air court this is of course much better. And it is hardly necessary to say that lawn tennis, racquets, and all such exercises are excellent for reducing undue weight. But I am here specially considering those who, being unwieldy, are not particularly anxious to exhibit their unwieldiness before the eyes of friends and acquaintances by taking part publicly in such games as lawn tennis or cricket. Even rowing is not a very soothing exercise to the obese if the ubiquitous 'Arry welcomes the athlete's exertions with cries of "Well rowed, fatty!" or other uncomplimentary comments on his volume.

Taking too much exercise is a ready way of increasing fat—paradoxical though it may sound to say so. A man not in good condition will perhaps take two or three days of very active or even violent exercise, drinking so much more than is necessary, on account of the unusual solicitations of thirst, that he can register very little loss of weight. Then he "caves in" for several days, being used up and feverish. During these days he eats, drinks, and sleeps more than usual, takes less exercise even than he had taken before he thus suddenly roused himself to exertion, and ere he is quite himself again, he finds, on weighing, that he has added to his bulk instead of diminishing therefrom.

In regard then to exercise as to all other methods for reducing undue fat, we advocate moderation on the one hand and steady perseverance in well doing on the other. Do not go in for great feats of strength or endurance to be followed by long spells of rest, but for steady exercise, continued systematically. If the other methods for reducing weight be followed steadily and moderately, for weeks and months, not for a few days only, the weight will be reduced safely to its proper amount, the breath and spirits improved, and the value of life notably increased.

International Electrical Society.

An international society of electricians has been formed in Paris, France, under the presidency of the Minister of Posts and Telegraphs, the society to be universal, and not confined to professional electricians; but it is intended to include all persons who are interested in the advancement of electrical science. Correspondence may be addressed to the Organization Committee of the Society of Electricians, 99 Rue de Grenelle, Paris.

ENGINEERING INVENTIONS.

Mr. Orlando Wetmore, of Nevada, Mo., has patented an improvement to locomotives and tenders, intended to increase the traction power of locomotives to the rails by additional weight. The device is to lift the forward end of the tender, so as to give its weight to to the after driving wheels of the locomotive.

Mr. W. Livingston Fisher, of Bay City, Mich., has received a patent on improvements in automatically acting car couplings employing the ordinary link and pin for connecting the cars. This improvement is so very simple, and may be so readily applied to cars already provided with the old style of coupling, that it recommends itself.

Mr. C. R. Sweet, of Portsmouth, Ohio, has recently received a patent for a very efficient road engine for use in the streets of cities, on farms, and on country roads, and also as a stationary power for farm work. The principal improvements in this traction engine are the improved construction in the brake wheel and brake mechanism, and to facilitate the steering of the guide wheel.

An improved balanced slide valve is patented by Mr. John J. De Lancey, of Binghamton, N. Y., the object of which is the balancing the steam pressure and the conducting of the steam that may leak past the outer edges of the balance plate; to the exhaust countersinks and grooves are provided for the admission of oil and steam between the face plate and balance plate, insuring thorough lubrication.

Mr. Riley Doty, of Leonardsburg, O., has patented an improvement in steam engine valves, by which he claims to allow provision for cutting off the inlet steam at any point of the stroke, and opening the exhaust until the piston in the cylinder has reached the end of the cylinder. The device allows the cut-off at any point of the stroke, and the adjustment of the exhaust at any point independent of the inlet.

A machine for removing the interlying clay from between seams of coal in a coal mine, to enable the coal to be more readily broken down than it could be by the present slow process of hand labor, is the invention of Mr. Richard Johnson, of Belleville, Ill. The machine is mounted on rollers for easy movement into position, and carries augers which are fed by screws, but which may be instantly withdrawn by means of releasing a half nut with which the feed screws engage.

Mr. Orlando H. Jadwin, of New York city, has patented a device for the improvement of railways driven by continuous cables, in which the supporting grooved guide wheels are seated on spring boards, so that their top surfaces may automatically adjust themselves to the variations of the weight of the conveying rope or cable upon them, thus preventing unnecessary tension. He also claims the construction of a rail forming the top of the cable tunnel that is hollowed to receive asphalt, cement, or other material to give horses on the surface roadway a firm footing.

MECHANICAL INVENTIONS.

Mr. James Lamont, of Sag Harbor, N. Y., has patented an automatic expanding and contracting die for forming the cases of watches and lockets of metal which are fastened with a snap, the die permitting the complete formation of the article without change of dies and without taking a composite die apart to release it from the completed shell.

Mr. W. J. Tait, of Jersey City, N. J., has patented an improvement on machinery for producing twists and spirals on wood. It is adapted especially to cutting spirals on baluster rods for stairways, and uses a rotary cutter instead of a fixed chisel, and the employment of a spiral blade for feed, the revolutions of which are adjustable.

Mr. Seth W. Lowell, of Fillmore, N. Y., is the patentee of an improvement in fruit evaporators in which he employs a heater at the bottom of the evaporator, a fan blower in the upper part, and a condenser of the vapor laden air at the top, the result of which is to cause the hot air to circulate through the fruit and to pass down at the sides after being deprived of its aqueous contents at the top.

An automatic oiler for carriage axles has been patented by Messrs. Sebastian Comstock and Edwin M. Comstock, of Cascade Valley, N. Y., by which the revolutions of the carriage wheels determine the amount of lubricant admitted to the axle, and this amount may be governed by an adaptation that can be changed according as much or less lubricating material is required.

Mr. Gilman Jaquith, of Maysville, Ky., has patented a whirl for bobbin spindles, whereby the cup is made to receive the bobbin freely upon the outside of it, and the bottom is caused to rest on a flange which forms a portion of the whirl, and by the introduction of a friction washer interposed between it and the bottom of the bobbin assists in driving the bobbin by friction.

Mr. L. F. Longmore, of Lowell, Mass., has patented an adjustable guide rest and holder for holding drills between the tail center and face plate, head stock, or chuck of a lathe to bore pieces revolving in the lathe. The drill is held by the holder, which is also a guide by which to enable the drill to center itself. This holder may be adjusted for holding drills of all sizes, enabling it to take the place of the numerous slot rests of different sizes now used for the purpose.

Mr. H. C. McIlwain, of Null's Mills, Ind., has patented an improvement on a domestic clother washer, based on the forcing of the washing water through the clothes. He contrives a cone like tub with flaring projections, and fitted with a plunger that compresses the clothes by its downward plunge, and raises them with the compressed air, allowing the air to escape through side apertures near the top of the tub and go to the bottom.

Messrs. O. H. P. Cornelius and G. H. Turner, of Turner, Oregon, have invented a dredging device intended to remove deposits of silt and sand in rivers by forcing against them a strong current of water, loosening them and driving them into the force of the natural current. The apparatus is attached to a suitable boat having a cavity in its bottom in which is a trunk containing a turbine wheel, and having a hinged discharge pipe that may be moved vertically and laterally to discharge the water at any angle desired.

Mr. Sanford C. Meddick, of Ovid, N. Y., has patented an arrangement for distributing pulverized fertilizers which he proposes to use as an attachment to field rollers. By extending the roller frame to the rear he attaches a V-shaped receptacle, the bottom aperture of which may be contracted or enlarged, and the contained fertilizer be comminuted by a longitudinal shaft carrying arms to stir up the fertilizer in the hopper by rotation, which is insured by suitable connections by bevel gears with the rotating rollers.

Mr. Milton Dainard, of West Exeter, N. Y., has obtained a patent for a device which consists of the arbor of a sawing machine provided with means whereby the saw may be removed and a boring tool may be attached and be rotated and shifted lengthwise for boring holes. This is likewise connected with the table in such a way that it may be readily converted either into a sawing machine table or a boring machine table. The arbor is also adapted for the application of a grooving tool in the place of the saw when required.

Mr. William H. Snyder, of Waynesborough, Pa., has invented and patented an improvement in the set blocks of saw mills by which the attendant can move the knees forward or backward without releasing his hold upon the handle rod, and without changing his position. This device may also be used in connection with a simultaneously working head block in which all the knees are adjusted equally from one shaft, or independent ratchets may be combined to act, so that one end of the log may be moved independent of the other.

Mr. Charles Johnson, of St. George, New Brunswick, Canada, has recently received a patent for an improved and simple fire escape. The invention consists in a bar adapted to slide on a rope, and to be retained thereon by means of an arm and eyes, which bar is provided with a brake lever for checking the downward movement. The brake lever can be locked in position by means of a locking ring adapted to slide on the bar and brake lever. A hook is pivoted to the bar, and is provided with a pivoted latch extending into the recess in which the hook is pivoted, whereby the latch will be held closed by the downward draught on the hook.

A patent has recently been granted to Mr. J. J. Towle, of Dixfield, Me., for an improved fruit drier, which consists of a vertical cylindrical case, between which and an inside vertical hollow cylindrical drum there is a spiral flue, in which the fruit to be dried is caused to pass from bottom to top several times around the case by pushing the trays containing the fruit forward successively from an opening at the bottom, where they are put in one after an other, to an opening in the top, where they issue from the flue, the flue being also a passage for hot air from a furnace at the base of the case, and the central drum being a chamber in which the products of combustion from the furnace circulate for drying the fruit.

Mr. Ami Le Coultre, of Geneva, Switzerland, has patented an improvement on chronographic watches intended to make their movements more reliable and to obviate the dangers of sudden breakage of the stop spring, by the use of the stop. He reduces the increasing tension of the spring produced by the heart wheel, and softens the recoil when the hand is released, by mechanism that does not interfere with the regular work of the watch, using for this purpose a flexible connection between the heart wheel and the hammer of the fly back mechanism and the spring. The flexure is a long spring linked to the acting spring of the stop, and preventing the shock of a sudden release.

Mr. Burchard Thoens, of New Orleans, La., has received a patent for an ammonia ice machine constructed with a retort for distilling aqua ammonia. The distilled aqua ammonia passes into a rectifier, and is then liquefied and collected in a vessel, from which it is liberated at suitable times and permitted to evaporate, cooling the uncongealable liquid surrounding the pipes through which the gases of ammonia are permitted to pass. These gases of ammonia are then collected and conducted into a vessel, in which the poor or weak ammonia liquor is converted into drops or sprays, thus absorbing the ammonia gas. This is then converted into rich ammonia liquor, and is sent back to the retort after having been heated sufficiently by the poor ammonia liquor. In this way the water contained in the water chamber will be absorbed and the ice will be formed.

AGRICULTURAL INVENTIONS.

Mr. J. J. Hussey, of Bordeaux, S. C., has patented an improved sulky plow so constructed that any form of plow or harrow may be used in connection with it, the plow, harrow, and cultivator attachments being all contrived for like application to the sulky.

Mr. Joshua C. Center, of Haynesville, Kas., is the patentee of an improved seed drill in which the feed shafts are made in two parts, placed in line with each other, and independently connected with the driving mechanism, so as to obviate side draught and so that both sides of the drill will work at the same depth in the soil on uneven ground.

Mr. R. M. Pattillo, of Cartersville, Ga., has received a patent for improvements in cotton planters, specially designed for use in connection with the "Law Cotton Planter," for the purpose of adapting the same to plant peas, corn, and other seeds. Its novelty consists in improved mechanism for delivering the seed, whereby the seed, instead of being planted in continuous rows, is deposited in the earth at intervals.

MISCELLANEOUS INVENTIONS.

Mr. Orson O. Newberry, of Vincennes, Ia., has obtained a patent for a sulky which he claims is stronger, more durable, and in other respects an improvement over sulkies heretofore in use. This invention relates to the manner of locating the seat on the axle, and improvements in arrangement of the supports and the means of attaching the traces.

Mr. S. R. Brick, of Stapleton, N. Y., has recently patented a safety gas tank for vessels. This invention relates to gasometers used for storing compressed gas in vessels, and is intended to prevent accidents by explosion of the gas escaping from the tank, and it is also contrived so that in case of collision the tank is immediately emptied by the opening of a gate.

Mr. Frank Harrison, of Loveland, Colo., has patented a saw guide for circular saws, using glass studs set up by set screws in a yoke which may be adjusted laterally as well as longitudinally. The guide may be swung out of the way when the saw is to be removed, and can be accurately adjusted to the varying thickness of the saw.

Mr. R. B. Lanum, of Circleville, O., has recently patented a receiving and burial vault. The invention consists in a mould for forming the chambers, which mould consists of two wedge-shaped pieces and a semi-cylindrical top piece, which pieces are all surrounded by a layer of paper for the purpose of rendering the surfaces of the chambers entirely smooth.

An adjustable book lock, which can be fitted to a book of any thickness, has recently been patented by Mr. M. C. Ogden, of Brooklyn, N. Y. The invention consists in a lock-casing held adjustably between two longitudinally slotted angle pieces pivoted to a plate adapted to be fastened to a cover of the book, to permit swinging the lock casing down when the book is to be opened.

An improvement in the construction of cornets has recently been patented by Mr. G. W. L. Schweich, of Richmond, Mo., whereby a full, clear bore wind passage with shorter action than those now in use is secured. Plenty of room is nevertheless left to secure perfect curves in the wind passages. The invention promises to prove of interest and importance to musical persons.

Mr. Stephen H. Chilcote, of Sego, O., has patented an ingenious and convenient combined can opener and corkscrew. The invention consists in a rotary can opener having its knife adjustable to suit the size of can, and with its handle portion formed to receive a corkscrew, the arrangement being such that the handle is an essential portion of both the can opener and the corkscrew.

A cheap and convenient leveling instrument for the use of planters and others who do not require the professional services of a surveyor, has been patented by Mr. William C. Holmes, of Atlanta, Ga. It is inexpensive and may be constructed by any mechanically inclined farmer, and is useful in leveling for ditches, laying drains, and many other purposes. It may be set to any incline from the horizontal as well as for a dead level.

A breast strap, slide, and hook has recently been patented by Mr. C. R. Farey, of Logansport, Ind. This snap device consists of a hook snap pivoted in a groove, and working through a guide in the end of the hook. The hook snap is worked by a thumb lever located in a chamber of the shank, from which the thumb bit protrudes in such a manner as to be effectually guarded against being accidentally shifted so as to open the snap.

Mr. Alexander M. Dye, of Minneapolis, Minn., has patented a personal fire escape that may be carried in the valise or trunk, and afford means of escape from hotel or any other building, by means of a window. It is a rope of manila, cotton, or hemp, furnished with a saddle strap and stirrup, and a grooved attachment through which the rope passes in curves, the passage being governed by the weight of the descending passenger or his or her action of the feet.

An effective and durable oyster dredge has been patented by Mr. J. N. Woodruff, of Fairton, N. J. The rake head of this dredge is provided with a series of rake teeth, so arranged as to enter the river bottom their entire projecting length, while a runner is provided which prevents the dredge from sinking further into the soft bottom. A trailing basket is connected with the rake head for receiving the oysters removed from the bottom by the rake teeth.

Mr. Charles Huck, of New Orleans, La., has invented and patented an improved telegraphic and telephonic cable in which provision is made for carrying off induced currents. The cable consists of a central core of straight parallel wires, and is overlapped by spirally wound insulated wires, these by spirally wound bare wires wound in the reverse direction, and covered by another coating of insulated wires, the whole suitably protected, the bare wires being connected with the earth.

A door brake to prevent the noise arising from the slamming of a door, and to hold it closed without a latch, is the subject of letters patent recently issued to Mr. W. S. Barlow, of Paterson, N. J. A holder having an elastic plate, its outer extremity forming an inclined wedge, is the device which is attached to the door casing in such a manner that in closing the door it will strike the heel of the inclined wedge, which will resist the pressure of the door, gradually brake and stop it, and hold the door closed.

A non-explosive lamp is the subject of a patent recently issued to Messrs. L. Baer, T. F. Miner, and Theo. Taylor, of La Grande, Oregon. A receptacle for holding water or any preparation for cooling the oil and preventing the formation of gas or for extinguishing fire is interposed between the oil receptacle and the burner. By the use of the water or other cooling substance in the receptacle, the temperature of the air between the burner and the oil is lowered, and the accumulation of explosive gas is prevented.

Mr. John W. Eastwood, of Denver, Colo., has patented an improved portfolio for the use of students, which is a convenient receptacle for books, pens, and pencils in a compact combination that makes an elegant parcel, can be easily carried on the person, preserves the contents from contact, and prevents rattling of the contents. A copy holder of thin metallic plate transforms the portfolio into a writing, copying, or drawing desk, and may be securely folded into the portfolio when not so used.

Mr. Gustav H. Moll, of St. Louis, Mo., has patented an umbrella that may be attached to its owner without trouble, as it will be useless to any one but the owner. The invention consists in a detachable handle which may be carried in the pocket, the withdrawal of which locks the ribs of the umbrella and the insertion of which unlocks the ribs. Changes may be made in the construction of the inserted handles to correspond with the combinations of the Yale lock keys, so that two fits to handles may reach near an impossibility.

A wrench for wagon axle nuts has recently been patented by Mr. T. L. Whitacre, of East Rochester, O. The object of this invention is to so construct a wrench for turning the axle nut of a vehicle that it may be hung by a hook in such a manner as to throw the nut holder out of a perpendicular plane, and thus prevent the nut from dropping out. This is effected by placing a hook and hand piece on opposite sides of the handle end, so that the weight of the hand piece will throw the nut holding end forward out of a perpendicular line.

Mr. Daniel Brobst, of Portland, Mich., has patented a roofing compound which consists of the following ingredients, viz., coal tar, broken asphalt, gum shellac, glue, salt, alum, gypsum, Roman cement, sulphur, resin, and benzine, all mixed together in certain proportions. The roof is first covered with three layers of felt, each layer being coated with a layer of the compound applied with a brush. The outer layer is then covered with a heavy coating of the compound, and dry sharp sand is spread over the mixture and pressed into it with an iron roller.

A cream can which is less liable to be dented or bruised by rough handling than those now in use and which is also intended to prevent the formation of cream into butter during transportation, has recently been patented by Mr. C. H. Blossom, of Algona, Iowa. The invention consists in a cream can constructed with a rectangular exterior wooden box having interior cleats, into which is fitted a rectangular tin can having tin covered top frame, and provided with a tin faced wooden cover having downwardly projecting tin flange, and a rectangular tin float having central opening and a hopper shaped upper side.

An improved coal scuttle for facilitating the insertion of coal in the fire boxes of cooking stoves has been patented by Mr. Rhys F. Lewis, of Wilkesbarre, Pa. This scuttle is made of such a shape that it may be inserted into a boiler hole in the stove top, and it is retained from slipping through by a suitable flange. The bottom of the scuttle is provided with a large opening which is closed by a sliding valve, so that when once the scuttle is placed in position on the stove, the valve is opened and the desired amount of coal is permitted to pass through into the stove, when the valve is again closed and the scuttle removed.

A self-watering flower vase has recently been patented. The stand of this vase is made of such a form as to hold water and support the basin or vase for the plant, which basin has a tubular arm at the bottom extending down into the base of the stand, so as to permit the water in the base to percolate through the small apertures in the tubular arm. In this way the earth in the vase will be kept constantly watered, and the vase with the stand may serve as an excellent fence post, so that if a series of these are employed, a very ornamental fence will be provided with flowers automatically watered, growing from the vases on the tops of the posts. The patentee is Mr. E. B. Chappell, of Bradford, Pa.

An improved grain drier has been patented by Mr. Albert E. Clutter, of Lima, O. This consists in a vertical smoke stack separated by brick partitions into grain passages and smoke flues, the grain passages being provided with openings at the top for the insertion of the grain and with like openings at the bottom through which the grain is discharged by gravitation. The smoke flues receive the smoke and heat of a furnace provided for the purpose, or the waste products of combustion from some other boiler or furnace. The grain is dried by the heat from the flues, the brick partition serving on the one hand to communicate the heat to the grain, and to absorb at the same time the moisture from the grain and deliver it up to the hot gases. Besides these advantages this drier enables different batches or different kinds of grain to be dried at the same time without being mixed.

Mr. F. F. Terramorse, of East Portland, Oregon, has patented an improved waterproof fabric (either silk or fine cloth may be used) for making gossamer clothing. The fabric to be made waterproof is immersed while hot in a compound of boiled linseed oil, lampblack, litharge, and a suitable drier, all mixed together in suitable proportions. After a thorough drying the article is placed on a mould and a coating of the mixture is applied with a brush or sponge, and rubbed smooth by the hand. After drying, the fabric is again placed on the mould and rubbed down with pumice stone, till perfectly smooth. A third coating of the mixture should be applied in the same manner as the second. The inventor claims that fabrics treated in this way look as well as rubber, are thoroughly waterproof, will not crack or break when exposed to heat or cold, are very light and have no disagreeable odor.

An ingenious and useful contrivance for cloakmakers has recently been patented in the United States, France, England, Germany, Austria, Italy, Denmark, Sweden, and Hungary. It consists of a nickel plated chain, the links of which are hard soldered, to take the place of the ordinary loops on garments, by which they are usually suspended. It is rather ornamental and is readily attached by simply puncturing two small holes for the reception of the screw shanks of two buttons, and securing the ends of the chain to the screws by means of a small key which accompanies each hanger. They are made in three different sizes, No. 1 for ladies' and gentlemen's light garments, No. 2 for light cloaks, No. 3 for heavy sealskin and fur garments. These clothes hangers recommend themselves to the public for their cheapness as well as utility, and are now being manufactured by the Patent Clothes Hanger Company, whose office is at 60 William Street, New York city.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

PHILIPP REIS, INVENTOR OF THE TELEPHONE. A biographical sketch, by Silvanus P. Thompson, B.A., D.Sc., Professor of Experimental Physics in University College, Bristol, Eng. Published by E. and F. N. Spon, London and New York.

This volume is *in memoriam* of Philipp Reis, of Freidrichsdorf, Germany, where he lived as a teacher when in 1860 he constructed his first telephone. This and subsequently constructed instruments, all made by himself, he exhibited before a number of societies from 1861 to 1864, and finally died of consumption in 1874, without having seen his invention applied to any useful purpose. Yet so much faith did Reis have in his discovery that a year before he died he said that he had showed the world the way to a great invention which must now be left to others to develop. The author and compiler of the volume points out by parallelisms that the subsequent Bell telephone was substantially that of Reis, who had produced audible articulate sounds by similar means fourteen years before Mr. Graham Bell's claims were made. In concluding the sketch of the work of Reis, Professor Thompson says: "If mere mechanical imperfections do not make an invention any the less a true invention, it would be dishonest to deny to Philipp Reis the honor of the invention of which he openly stated the successes and the imperfections." The volume is illustrated by explanatory engravings showing the original Reis telephones with all their details of construction.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) G. C. D. & Co. ask: Can you inform us of any substance to make the surface of imitation morocco cloth waterproof so that rain will not leave spots on it or tarnish it? A. See article on Waterproofing Cloth in SCIENTIFIC AMERICAN SUPPLEMENT No. 317.

(2) L. E. R.—The following is a receipt for marine glue which we think will suit your demands: Dissolve by heat one part of pure India rubber in naphtha; when melted, add two parts shellac; melt until mixed. Pour while hot on metal plates to cool; when required for use melt and apply with a brush. Liquid glues such as the following:

White glue	16 ounces.
Dry white lead	4 "
Soft water	2 pints.
Alcohol	4 ounces.

Stir together and bottle while hot.

(3) J. S. F. B.—Sir Humphry Davy used a voltaic battery of not less than 100 double plates for his separation of boron. Any small battery can be used for this purpose, and you will probably require a large number of the smaller sized cells.

(4) W. F. B. asks for a good ink eraser. A. Oxalic acid is frequently used for this purpose. It is dissolved in water and blotting paper dipped into it, and this slightly moist applied to the ink spot. Or cover the spot with tallow and then apply sodium pyrophosphate until both tallow and ink have disappeared. See SUPPLEMENT No. 157.

(5) T. H. C.—SUPPLEMENT No. 158 gives a number of recipes for glues of various kinds; among others a good waterproof glue will be found.

(6) J. D. H.—SCIENTIFIC AMERICAN SUPPLEMENT, No. 350, contains an article on sirups made from different fruits which we think will cover your wants. SUPPLEMENT No. 126 gives formulæ for making artificial fruit essences. In Dick's Encyclopædia of Practical Recipes and Processes will be found all the information you need.

(7) A. L. B.—A good deep black is obtained by working for an hour in a solution of 8 ounces iron sulphate (copperas) and two fluid ounces iron nitrate, and after washing out, work in the decoction of logwood and chamber lye; lift and add 2 ounces more of iron sulphate in solution; work fifteen minutes, wash, and dry. An article on silk dyeing on p. 2878 of SCIENTIFIC AMERICAN SUPPLEMENT No. 181 will be found to contain valuable matter.

(8) M. M. S. asks (1) how to clarify cotton seed oil to give it a clear yellow color. A. The crude oil is heated to about 90° Fah. by means of steam coils, and a cold solution of sodium hydroxide (caustic soda) is slowly added while the whole is vigorously agitated. One gallon of the alkaline liquor usually suffices for twenty gallons of oil, but sometimes more is needed to bring it to a light straw color. The mixture is then allowed to settle and the supernatant oil separated and filtered. 2. How to bleach vegetable wax, containing a great deal of stearine; how to take out the stearine so as to make it fit for wax or paraffine candle making. A. The wax is first heated at 180° C. until water and light oil are evaporated. The mass is then cooled to 100° and mixed while stirring with 10 per cent sulphuric acid of 66° B. It is next heated to 150° C., until a sample of the mass filtered through bibulous paper furnishes transparent white drops. It is again cooled to 100° and 20 per cent dry and finely sifted sediment of potassium ferrocyanide are added, with which it is again heated to 180°, until effervescence ceases. The mass is poured into tin sheet coolers, pressed in a stearine hot press, and the press residue filtered through an unsized filter heated with steam.

(9) N. A. W. writes: I have frequently stained pine table tops with permanganate potassium, but an acid discolors them. If I stain with an acid, an alkali will also discolor them. Will you please give in correspondents' column of SCIENTIFIC AMERICAN a durable, nonpoisonous, cherry and blackwalnut stain? A. Use alkanet root dissolved in vinegar; boil the solution and dip the wood in two or three times according to the shade desired. Blackwalnut may be produced by mixing a little dragon's blood with the above according to the shade desired.

(10) E. E. W.—Bird lime is made by boiling the middle bark of the holly seven or eight hours in water; drain it and lay it in heaps in the ground covered with stones, for two or three weeks, till reduced to a mucilage. Beat this in a mortar, wash it in rain water, and knead until free from extraneous matter. Put it into earthen pots, and in four or five days it will be fit for use. An inferior kind is made by boiling linseed oil for some hours, until it becomes a viscid mass.

(11) H. J. writes: 1. I have an engine 3¼x5 inches. Steam is supplied by a tubular boiler 3 feet long by 19 inches in diameter and containing 19 flues. Would the above machinery propel a flat bottomed skiff 22 feet long 6 feet beam and 18 inches deep? A. Your boiler will be rather small; the engine should be geared 4 or 5 to 1. 2. What diameter of paddle wheel should I have, and what length and breadth of bucket? I intend to gear the engine so that it will run 3 revolutions to the paddle wheel shaft's 1. A. Wheels we think should be 5 to 5½ feet diameter by 18 inches or 20 inches width. 3. Also, about how great a weight would a boat of the above size sustain in the water? It is intended to carry a party of four on a fishing excursion on a slack watered river where there is little or no current. A. We cannot tell weight the boat will carry, as we know nothing of the model, but undoubtedly will carry 4 or 6 persons.

(12) J. R. C. asks: Can you tell me what acid or preparation is used to prepare a transfer on zinc so as to be able to print from it the same as from a lithographic stone? A. A description of the zinc process will be found on page 1310 of the SCIENTIFIC AMERICAN SUPPLEMENT No. 93. See also page 2276 of the SCIENTIFIC AMERICAN SUPPLEMENT No. 143, for description of process used. Nitric acid is the agent generally employed.

(13) H. C. A. asks (1) whether it requires a battery for the telephone described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 142, or not? A. No battery required. 2. Which direction should the wire be wound around the spool? A. It is immaterial. 3 How can I make a cheap electric call bell for telephone? A. See SUPPLEMENT No. 102.

(14) W. L. S. writes: In No. 160 of the SUPPLEMENT gives the directions for making an induction coil; the size there given says, make the primary with No. 16 cotton covered wire, the secondary with No. 36 naked, and tin core with No. 18 iron wire. Now I want to make one just twice as large; should I use the same wire as the small one above? A. Wire of the same size will answer.

(15) H. S. T. writes: 1. I have a forty-five horse power tubular boiler, new; my engineer almost every morning, after raising from twenty to forty pounds steam, opens the blow-off cock and blows out about a barrel of water. He claims that the boiler will make steam faster and help to keep the boiler clean. By doing this is steam generated faster? I claim it is injurious to the boiler, as the pumps are worked as soon as the engineer has blown off. A. The best time to blow off a boiler is at night or at the time of stopping work for the day. Then the dirt is thoroughly stirred up from the day's steaming, whereas in the morning it is settled upon the tubes and bottom of the boiler. At night when the engine stops the water can be blown down nearly to the tubes with safety, as that is the time for banking or drawing the fires. The pumping up can be done slowly without straining the boilers by suddenly cooling the bottom. Blowing off each day is too often unless the water is very foul with mud, clay, or lime. Twice a week with good water is sufficient. The boiler should be opened and cleaned out once in one or two months according to the quality of the water. 2. What is the best way to keep a three inch saw mandrel from heating? I use the best of oil and the boxes are not tight. They do not cut at all, but seem to get hot only when sawing a log. A. The pressure is greater upon the journals when the saw is cutting. Possibly the journals are not long enough. None but the best cold pressed lard oil should be used upon such journals. The combination oils that have petroleum in them are not good for high speed journals.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

N. L. P.—The specimen contains pyrite (iron sulphide), a mineral which sometimes carries gold with it. It is also called fool's gold on account of its yellow color.—G. W. M.—The specimen is pyrite (iron sulphide), and generally carries gold. An assay will be necessary to determine its value.—T. A. C.—Hematite is the mineralogical name of the articles you refer to. It is a peculiar variety found in England only.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 4, 1883,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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Amalgamating pan, C. Gracey 284,368
Amalgamator, Dane & Card 284,503
Androides or automaton shoe factory, R. G. Shute 284,320
Annealing cast steel or iron, J. Henderson 284,320
Axle, car, C. E. Eaton 284,104
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Bagasse furnace, J. C. Semones 284,246
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